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Annals of Otology, Rhinology and Laryngology

FOUNDED BY JAMES PLEASANT PARKER

INCORPORATING
THE INDEX OF OTOLARYNGOLOGY

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XXIII.

OSTEOMYELITIS OF THE CRANIAL BONES SEC-
ONDARY TO PARANASAL SINUS
OPERATIONS.*

BY HAROLD I. LILLIE, M. D.,

SECTION ON OTOLARYNGOLOGY, MAYO CLINIC,

ROCHESTER, MINN.

For a rather complete bibliography on the subject of osteomyelitis of the cranial bones secondary to paranasal sinus operations, one needs only to review Lemere's excellent article in which he records sixty cases, including one of his own. The incidence of the disease must be very low when one considers the large number of disease conditions of the paranasal sinus encountered in practice. The reported cases are discouraging so far as successful management is concerned. The question naturally arises: Is there not a stage of the disease at which it may be controlled by some means?

McKenzie, in his review, classifies osteomyelitis of the cranial bones into (1) localized osteomyelitis, which has no

*Read before the American Laryngological Association, Swampscott, Mass., June 2-4, 1924.

tendency to spread, and heals after the disease focus is removed, and (2) diffuse or spreading osteomyelitis, which has a tendency to progress in spite of all procedures; the latter is further divided into a spontaneous type, appearing to come from the unoperated sinus, and a postoperative type, occurring after an operation on the frontal sinus. In twenty-one spontaneous cases that McKenzie collected from the literature there were seven recoveries, while in twenty cases occurring postoperatively there were no recoveries. He advocated radical removal of the bone. Thus far, nothing more constructive has been suggested for the management of these cases.

REPORT OF TWO CASES OBSERVED IN THE MAYO CLINIC.

Case 1 (A450866).—A woman, aged thirty-four years, presented herself at the clinic December 21, 1923, complaining of discharging sinuses in the left cheek, left inner canthus, swelling of eyelids on both sides, and a discharge from the left ear. The trouble had followed a radical alveolar operation on the antrum, performed elsewhere, in October, 1923. The operation had been undertaken because in the course of a general physical examination, X-ray examination of the head had disclosed a cloudy antrum, and the patient had complained of pain in the left cheek. The patient felt much better for two weeks after the operation; then the left eyelids, the left side of the face and the right upper eyelid began to swell. Early in December, the swelling was incised; a copious purulent discharge and a decrease in the amount of swelling resulted. A parotid fistula developed, and at this time a definite sequestration of bone was discovered. About the middle of December the left ear began to pain and to discharge slightly. There had been fever, but no chills or sweating throughout the illness.

The examination revealed both eyelids to be swollen and edematous, nearly closing the eyes. Pus and infected granulations presented through an incision in the upper canthus on the left side. On probing, it was found that the tract led into the ethmoid and that the lacrimal bone was sequestered. The left side of the face was swollen and red. The parotid fistula was draining pus and salivary secretion. The left ear was discharging thick, foul smelling pus through an anterior inferior perforation. There was no drooping of the wall of the

canal, no swelling of the mastoid and no tenderness on deep pressure. Intranasal inspection revealed the antrum to be open and draining. The membranes at the left middle meatus were definitely edematous and bathed in pus. The neurologic examination did not reveal positive signs. Urinalysis revealed an acid reaction, a trace of albumin and pus cells, twenty in a field. The erythrocytes numbered 4,020,000 and the leucocytes 12,900. The polymorphonuclear count was 74 per cent and the hemoglobin 65 per cent. The Wassermann reaction was negative on three examinations, as were the spinal fluid and Nonne test. The colloidal benzoin reaction was 000 000 300 000 000 with no organisms; there were no growths on blood agar and few cells. X-ray examination of the head revealed extensive osteomyelitis of the frontal bone, nasal, malar and left parietal, and a densely cloudy left antrum, probably syphilitic in nature (Figs. 1, 2 and 3). A diagnosis was made of extensive osteomyelitis of the cranial bones, secondary to paranasal sinus disease.

In face of the negative laboratory findings, it was thought best to try treatment for syphilis, and the patient was hospitalized on the day of admission. For eighteen days she had a low grade fever. With hot dressings and drainage, local improvement was apparent, but the treatment for syphilis was ineffective and the provocative test was negative. Results from the laboratory tests varied but little from the initial tests. Cultures of the pus, dextrose broth and blood agar produced staphylococcus and nonhemolytic streptococcus. The patient's general appearance did not improve; there was a peculiar sallow, septic look, a mental apathy and a sweetish odor that gave one the impression of a serious illness.

In January, 1924, it was decided, with the consent of the husband, although a very grave prognosis was given, to perform a radical type of operation in an endeavor to check the disease. There were no definite signs of intracranial involvement. The spinal fluid examination was negative; the leucocytes varied between 14,000 and 18,000, and the hemoglobin was about 65 per cent (Dare method).

January 10, a radical frontal sinus operation, after the method of Killian, revealed an extensive osteomyelitis with sequestration of lacrimal, nasal and frontal bones (Figs. 4 and

5). It was impossible to remove the diseased bone completely. The inner table of the frontal bone was very red and bled considerably. The bone was uncovered well up to the hair line. At the frontoparietal suture, a very definite difference in the bone was noticed, the parietal bone appearing quite normal. Culture of pus produced staphylococcus and streptococcus (not classified).

Postoperative Course.—For ten days there was little or no change except that the external wound closed satisfactorily. The parotid fistula closed also, and the external appearance was definitely better. The patient became progressively weaker. On the thirteenth day there was weakness of the right arm and leg. Sensation, however, was quite normal; mental apathy was more marked; spinal fluid examination was negative, with no organism from culture; there was no extraocular paralysis; the fundus revealed a slight fullness of the nasal disc border on the left side; the right side was negative. It was believed that a left frontal abscess was forming. On the fifteenth day there was Jacksonian convulsion of the right side, followed by hemiplegia. The leucocytes numbered 28,000. The patient became progressively worse and died January 30, twenty-three days after the operation.

Necropsy.—As the scalp was dissected from the cranial vault about 5 c. c. of purulent fluid exuded from the region over the frontal bone. It floated away from this area and was seen to come from the operative area of both frontal sinuses. The frontal bone was necrotic and markedly osteoporotic. The superior longitudinal sinus was completely filled with a purulent fluid, which had extended to the right lateral sinus. Both jugular veins were thrombosed at the foramen. The superior surface of the brain was covered with a purulent exudate, extending over the temporal area down to the base, and about half this distance to the right. The exudate extended from the operative area anteriorly over the crest of the cerebral hemispheres to the occiput. There was no extension of the exudate to the base of the brain. The ventricles were not distended and did not contain abnormal fluid. There were no abscesses in the cerebral cortex. A slight amount of purulent fluid escaped from the right optic fossa, from the ethmoid cells

and from the sphenoid sinus. The pituitary and pineal glands did not show gross lesions (Fig. 7).

Case 2 (A436536).—A man, aged thirty-three years, presented himself at the clinic August 8, 1923, because of severe generalized pain in the head and multiple discharging sinuses from various areas of the scalp. While he was in the army suppurative sinusitis had developed following influenza, and coincidentally an attack of suppurative otitis media. Since then he had had several attacks which had resolved satisfactorily. In 1920 the sinuses had been operated on, affording slight relief, but the condition never was completely controlled. In 1922, the left frontal sinus was opened through an external incision, and later a subperiosteal abscess was opened above the frontal sinus. In January, 1923, many pus pockets were opened and drained. In March, more pockets were opened. Practically the whole scalp was affected, so that it was necessary to envelop the head in a complete dressing. Dressings had been done nearly every day. There had been little or no improvement in the suppurative process. The pain had been very intense on certain days; on others the patient was more or less comfortable. However, he was never free from discomfort. There was no history of syphilis, no night sweats, in fact, on other symptoms. There had been considerable loss of weight and debility.

On examination the patient appeared ill. The temperature was 99°, the pulse rate was 88, the systolic blood pressure 100 and the diastolic blood pressure 70. X-ray examination of the chest revealed an infiltration of the first and second interspaces on both sides, appearing like an active lesion on the right side; however, several sputum examinations were negative. Repeated Wassermann reactions on the blood were negative. Smears of the pus were negative for actinomycosis, and no sulphur bodies were demonstrated. There was a trace of albumin and a few red and white blood cells in the urine. The hemoglobin was 58 per cent, the erythrocytes numbered 4,850,000, the leucocytes 41,700; the differential count of 200 cells was, neutrophils 91.5 per cent, large mononuclears 3.5 per cent, and lymphocytes 5 per cent. Examination of the fundus was negative. Cultures of the blood and the spinal fluid were negative. A roentgenogram of the head revealed

extensive destruction and thickening of all the bones of the skull, suggestive of syphilis (Fig. 8). On the head were many postoperative scars which drained pus. Several swellings had not been opened. The nose showed the effect of satisfactory intranasal operative interference. There was a fistula into the left frontal sinus. A tentative diagnosis was made of extensive osteomyelitis of the cranial bones, secondary to sinusitis, probably syphilitic or tuberculous in nature (Fig. 6).

Course in Hospital.—The case was approached from the standpoint of syphilis, in spite of negative blood Wassermann reactions and the fact that clinically the condition appeared to be of a pyogenic nature. The condition of the lung naturally suggested tuberculosis, but this could not be confirmed (guinea pig inoculation was negative subsequently). There seemed to be nothing to do surgically. The patient died on the eighteenth day following admission. The symptoms were intracranial but not localizable, and the spinal fluid was negative. Necropsy was refused.

COMMENT.

At the time these patients presented themselves, their general septic appearance did not indicate a good prognosis. The second patient had many sinuses draining a thick creamy pus. His mental attitude was apprehensive, yet he was apparently resigned to the hopelessness of his condition. The first patient had been ill for a much shorter period; her attitude was anxious and really pathetic.

An interesting feature in both cases was the fact that the osteomyelitis followed operative interference on the maxillary sinuses. McKenzie, in his review, asserted that such sequelæ must be rare because the superior maxillary bone is denser than the frontal bone, which is more often the primary focus. The reason why osteomyelitis occurred is an interesting conjecture and open to argument. The patients apparently had been managed in an intelligent, scientific manner, but nothing seemed to check the progress of the disease. Multiple foci form so rapidly as to indicate that the process is blood borne, although not through the general blood stream, or that it extends through the lymphatic channels.

In both cases the blood cultures proved negative. The general toxic condition could not be explained on the basis of a blood borne infection. Other organs, which one would expect to find involved in a long continued infection, seemed to escape; for example, the kidney and heart. Examinations of the blood revealed nothing of note. In Case 1, the leucocytes numbered 14,000; in Case 2, 41,000. The hemoglobin in both cases was between 60 and 65 per cent, by the Dare method. In fact, the general picture was that of a secondary anemia, naturally to be expected.

Roentgenographic findings were interesting, and at first seemed to offer an explanation, because they suggested a syphilitic process. In spite of several negative Kolmer blood tests for syphilis, a provocative test was made with negative results. In Case 2, the finding in the lung of an old lesion indicated tuberculosis. Sputum and guinea pig studies, however, gave negative results.

Spinal fluid studies also proved disappointing; in each instance negative results were obtained up to the time of death. Bacterial studies in both instances produced mixed staphylococcus and streptococcus (unclassified) cultures for all mediums. In Case 1, culture of the diseased bone obtained at operation, and in Case 2, of sequestered bone, gave the same results as were obtained from the cultures from the discharge. The clinical temperature charts are interesting but not particularly illuminating (Figs. 9 and 10).

The necropsy findings in Case 1 are very instructive. Even had the diseased bone been removed completely, the secondary foci would have resulted fatally. The brain lesion was cortical, a suppurative disease of the surface rather than an abscess formation. No attempt at encapsulation whatever was manifested. The longitudinal sinus contained pus. The appearance of the diseased frontal bone and the parietal bone changed abruptly at the suture. The frontal bone came away as a sequestrum. The secondary focus in the left parietal bone which resulted in the brain complication was relatively far removed (Fig. 6).

The operative field seemed to be taking care of itself satisfactorily. Externally, at least, the wounds closed satisfactorily,

and at necropsy nothing was encountered to make one feel differently.

Death in each instance was apparently due to the intracranial extension, but in Case 1 the involvement was not basilar. McKenzie believed that in most instances a basilar involvement was the cause of death.

SUMMARY.

Osteomyelitis, secondary to disease of the paranasal sinuses, is an extremely grave complication. The disease may continue over a rather long period. In fact, in Bryan's case the disease was apparently controlled by a radical operation, but after a period of eleven months the patient died of a subdural abscess. One must resort to radical measures, even though deformity, which becomes a minor consideration, may result. The present day conservative attitude toward radical paranasal sinus operations, which result in a high percentage of cures with some apparent deformity, must be discarded when dealing with osteomyelitis secondary to disease of the paranasal sinuses. The X-ray may show a picture quite typical of syphilis, but in association with sinus disease osteomyelitis must be suspected.

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Fig. 1. Roentgenogram showing destruction of frontal bone in Case 1.



Fig. 2.

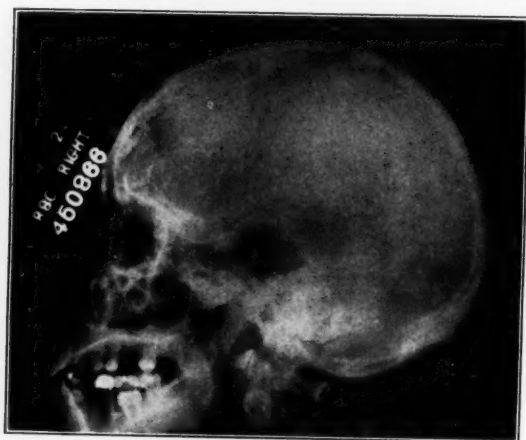


Fig. 3.

Figs. 2 and 3. Roentgenograms showing condition of skull in Case 1.

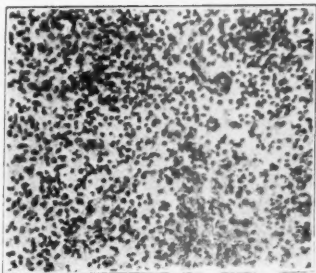


Fig. 4 (Case 1). Photomicrograph of bone sequestrum removed at operation, showing generalized necrosis.



Fig. 5 (Case 1). Photomicrograph of bone specimen removed at operation, showing effect of infection.

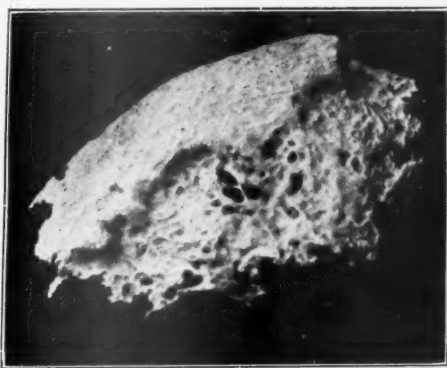


Fig. 6 (Case 1). Portion of frontal and parietal bone after drying.

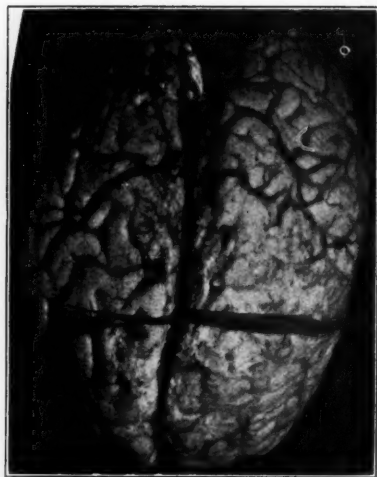


Fig. 7 (Case 1). Brain surface and region of cortical suppurative lesion.

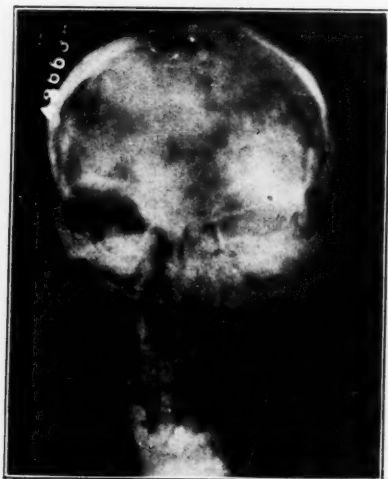


Fig. 8. Roentgenogram showing condition of cranial bones in Case 2.

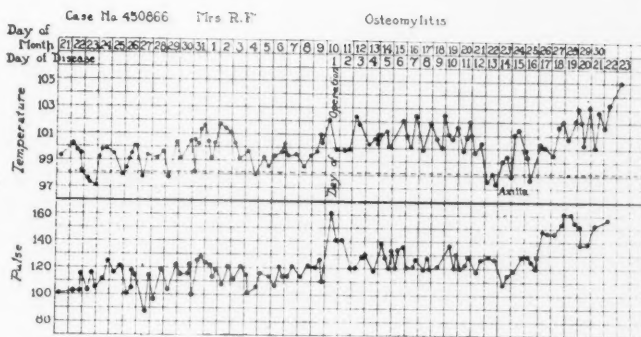


Fig. 9 shows clinical chart of Case 1.

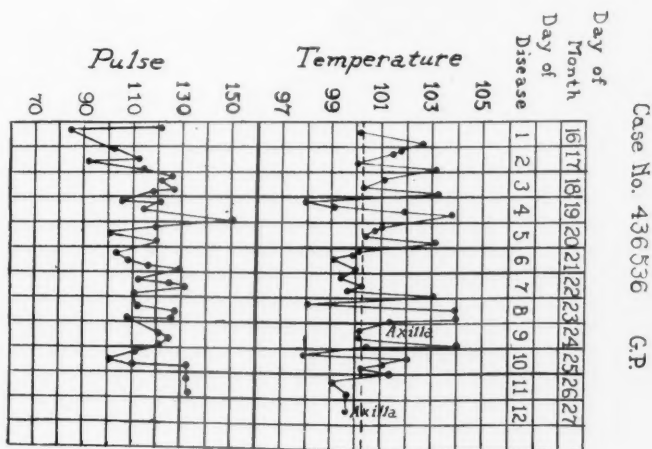


Fig. 10 shows clinical chart of Case 2.

XXIV.

STUDIES ON FUSIFORM BACILLI AND SPIROCHETES—OCCURRENCE IN PUTRID ETHMOIDITIS.*

By I. PILOT, M. D., AND F. L. LEDERER, M. D.,

CHICAGO.

In previous studies, we have demonstrated that the fusiform bacillus and the associated spirochetes are important etiologic factors in putrid and necrotic lesions.¹ In the mouth, where they normally reside, they are responsible for certain types of foul pyorrhea, ulcerative stomatitis and the typical Vincent's angina. Like the streptococci and other pyogenic bacteria in the mouth and oropharynx, they may extend into the middle ear and give rise to the fetid discharges in chronic otitis media.² The following report is of two patients with putrid ethmoiditis, in which these anaerobes appeared to be the underlying agents.

Case 1.—Female, complained of blindness of right eye and periodic nasal discharge for six months. On examination, she presented a right exophthalmos, complete ophthalmoplegia and right optic atrophy. The nasopharynx was constricted by old healed gummata. The blood Wassermann was positive. On postmortem examination the ethmoid cells were found filled with thick pus, and the bony tissue was involved in a marked necrotic process, extending through and involving the right optic nerve and the anterior clinoid process. The pus was grayish green and of a putrid odor. In smears many fusiform bacilli, spirochetes were found, together with cocci and short bacilli (Fig. 1).

Aerobic cultures on blood agar revealed moderate numbers of *B. capsulatus* and hemolytic staphylococci. The anaerobic cultures in addition contained many typical and pleomorphic forms of fusiform bacilli.

*From the Department of Pathology and Bacteriology, University of Illinois, College of Medicine, and the North Chicago Hospital, Chicago, 1924.

Microscopic examination of the involved bone showed poorly staining osseous tissue covered by a pyogenic membrane containing enormous numbers of bacteria and cellular debris. In Levaditi preparations of the decalcified bone, many fusiform bacilli, spirochetes and cocci occurred in the exudate, but no spirochetes could be seen in the bony tissue. Morphologically the spirochetes were of the Vincent's type and not those of syphilis.

Case 2.—Miss E. F., white, 26, entered June 17, 1923, complaining of discharge, odor and crusts from the nose for the past three years. She had frequent colds and attacks of sore throat. She also complained of cough and expectoration with general ill defined pains over the body. On physical examination, the nose showed evidences of pus in the lower straits on both sides, with crusting in the upper straits. The pharynx revealed postnasal droppings. The tonsils were absent. The teeth were in good condition. In X-ray films of the sinuses, all were somewhat clouded, but the ethmoids were particularly involved. The lungs presented on physical and X-ray examination no definite lesion. The remainder of the examination revealed no abnormalities. The Wassermann on the blood was negative. The sputum was distinctly foul, but the origin may have been from the postnasal droppings. In smears of the expectorated material spirochetes, fusiform bacilli and cocci were found.

Operation.—July 8, 1923, under local anesthesia; the ethmoid cells were drained. The cells were definitely osteitic and when opened a yellow foul pus exuded. Smears of the pus revealed fusiform bacilli, spirochetes and cocci in abundance. On examination, three weeks later, the reaction had greatly subsided. The cough was considerably lessened. The crusts occurred in the form of casts in the nose, and the odor was still foul. On August 12, 1923, in smears of nasal discharge, the bacilli were still demonstrable, while the spirochetes were absent. The sputum was free from these organisms. The odor and crusting persisted and were not effectively influenced by local measures. On August 1, 1923, 0.3 gram of neosalvarsan was administered. Improvement was noted on returning two weeks later. The discharge and odor were distinctly less. Twelve doses of neosalvarsan were given, and in eight weeks

the odor, secretion and crusting had entirely disappeared. The patient was under constant observation since that time and showed no crusting. The nasal mucosa do not appear atrophic at the present time.

Smears were stained with 10 per cent carbol fuchsin and by the Fontana method. The fusiform bacilli were typical rods with tapering ends, solid staining, or often granular. In cultures they were pleomorphic. The spirochetes varied in size. Shorter forms contained three to six turns, while the longer six to fifteen. In Fontana preparations, they appeared coarser than when stained by carbol fuchsin (Fig. 1). In their morphology the bacilli and spirochetes resembled those observed about normal teeth and tonsils, in Vincent's angina, pulmonary gangrene and putrid otitis media.¹

As in other lesions, these organisms did not appear in pure culture but were associated with pyogenic bacteria, such as staphylococci, *B. capsulatus* and streptococci.

The striking characteristic of the infection of the ethmoid cells in both instances was the foul character of the pus. In this respect, sinus infection with these organisms resembled in their behavior the putrid processes observed about the mouth and in the lungs. In most of these infections the sources of infection are those organisms found normally about teeth, tonsils and in the nasopharynx. In the tartar of teeth they are constantly found. In the tonsils, bacilli occur in 82 per cent, spirochetes are particularly numerous in the granular actinomyces like masses. In the adenoids the bacilli were observed in 32.6 per cent and spirochetes in 5 per cent.³

The discharge from typical cases of ozena was examined in several instances for these organisms, with negative results. It is possible, however, that fetid discharges from the nose may not always be true ozena but due to fusospirochete infection of the sinuses. Such infections should be recognized, as they may be influenced by neosalvarsan therapy in addition to surgical measures.

SUMMARY.

In two patients the ethmoiditis was of putrid character, and in each fusiform bacilli and spirochetes were found.

These organisms appeared identical with those observed

about normal teeth, tonsils and adenoids and in the putrid processes of the mouth and lungs.

In one patient the use of neosalvarsan seemed to influence the infection.

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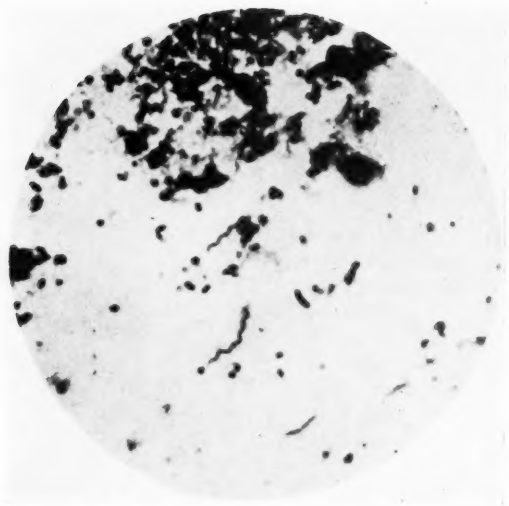


Fig. 1. Fusiform bacilli, spirochetes and cocci in smear of pus from patient with putrid ethmoiditis. (Fontana stain.)

THE LARYNGEAL PATHOLOGY OF CRETINISM.

By E. M. JOSEPHSON, M. D.,

NEW YORK.

The writer has had the opportunity to observe cases of myxedema and cretinism from the point of view of the laryngologist. The case here presented is the first on which he has had the opportunity to make a thorough study of the pathology of the larynx of a case of hypothyroidism, for which opportunity he here offers an expression of gratitude to Dr. Max Weiss and the other officers of the New York City Children's Hospital. The laryngeal specimen of this case presented the same appearance in the gross as that of cases of myxedema, with the exception that the cretin larynx is dwarfed in size, and it appears probable that the microscopic pathology of the two conditions may be similar.

The patient, B. L., was a typical cretin, 45 years of age. He had been confined to the above mentioned institution for about two decades. An attempt had been made, about a decade ago, to transplant thyroid gland into him, with no marked success. Up to a number of years before his death, he was on a systematic thyroid therapy. To what extent this treatment affected the pathology of the larynx is an open question. But if the reaction of the cretin larynx resembles that of myxedema, the treatment affected it only temporarily, returning to the status quo when treatment was discontinued, as was observed by the writer in a case reported by him.

PHYSICAL EXAMINATION.

September 28, 1916. B. L.—Height: 3 ft. 7 in. Weight: 53 pounds. Short neck.

Head: Vertex occipital flattened anterior, posterior diameter, 17 cm.; lateral diameter, 13.5 cm.; mentooccipito diameter, 21 cm. Hair coarse and thick. Tawny skin, coarse and wrinkled.

Eyes: Small, pupils react sluggishly to light; no strabismus or nystagmus; puffy lids. Cheeks show pads of fat.

Nose: Broad flat nose; distended nostrils; no deviated septum.

Lips: Thick lips.

Tongue: Large tongue, with papillae hypertrophied.

Teeth: Imperfect, separated, and show considerable decay; occlusion of jaw good, but articulation poor; some pyorrhea alveolaris. Tonsils normal; throat negative. No palpable glands.

Chest: Shows distinct superficial veins, excursion equal and respiration diminished. Slight harsh vesicular breathing at left apex; otherwise normal; no râles or areas of consolidation.

Heart: Slightly enlarged; action slow and regular; second sound roughened; no murmurs; articulation sluggish and pulses slow but equal. There is slight lumbar lordosis.

Abdomen is tumid, large and pendulous, tympanitic; no masses or tenderness; spleen and liver not palpable. The limbs are short and misshapen and the gait awkward, waddling and uncertain.

Hands: Large and spadelike, with flat and stumpy fingers; ringworm of third finger and thumb of left hand. The reflexes are present and normal. There is an apparent absence of the thyroid gland; disposition is gentle and affectionate.

Voice: The patient's voice was shrill, high pitched, thick and often hoarse.

SUMMARY OF PSYCHOLOGIC EXAMINATION.

July 20, 1921. B. L., born 1878—Estimated from record. Chronologic age, 43 years. Mental age: Composite rating, 6 years 3 months, I. Q. 42 per cent. Scale ratings composing above: Stanford-Binet, 6 years 5 months, I. Q. 43 per cent; Pintner-Performance, 6 years, I. Q. 40 per cent.

Subject has a basal mental age of 5 years, and successes range to eight years. Memory for numbers is of 4 year level, for words 3 years. Vocabulary is below 8 years, and description of pictures in 7 year tests gave failure. Social comprehension is below 8 years. Time orientation, below 7 years. Failure in 8 year comprehension and subject's contentment in present indicates thinking of concrete order only.

No school training is recorded of subject.

Physical record classifies subject as a cretin.

Recommendation: Continuance of institution care.

L. E. POULL, Psychologist.

AUTOPSY PROTOCOL.

B. L. Died: October 26, 1923. Autopsy: October 26, 1923.

General appearance: The body is that of an adult male, white, of infantile stature. Total length, 44 inches. The wizened appearance of the face is in marked contrast to the stature and general configuration of the patient. There are no axillary hairs, and but few pubic hairs present. The skin of the cheeks bears a darkish brown pigmentation. The proportions of the patient are well preserved. On median section there is noted a scarcity of subcutaneous fat. The peritoneum is smooth and glistening and contains no fluid. The appendix is atrophic. The liver margin is identical with the costal in the midclavicular line. The chest plate is removed. The lungs are collapsed, no fluid, no adhesions. The pericardium is smooth and glistening and contains about one ounce of clear straw colored fluid.

Lungs: Section of the lungs reveals nothing abnormal.

Heart: There is a slight increase in epicardial fat. The heart muscle is brownish and soft. The endocardium is smooth and glistening. There are no valvular lesions. The aorta presents at its root numerous fatty patches. The elasticity of the aorta is markedly preserved. The diameter of the artery at its widest point is approximately one-half inch. It is markedly hypoplastic throughout.

Liver: There is an angioma in the right lobe near the surface, about 1 cm. square. No further changes.

Stomach: No lesions.

Pancreas: No lesions.

Spleen: Markedly atrophied. Firm. Some increase in interstitial tissue.

Intestines: Small intestine presents some follicular hyperplasia. The large intestine is the seat of a very extensive pseudomembranous colitis. The ulcers extend through and through the submucosa.

Kidneys: The left kidney is enlarged to about four times its normal size. It is the seat of numerous calculi of various

sizes, completely filling the calyces. There is scarcely any kidney tissue left. The right kidney is also markedly enlarged but not as evidently as the left. It likewise is the seat of numerous calculi with tremendous distention of the calyces with urine. There is scarcely any kidney tissue left in this kidney also.

Bladder: There is some hypertrophy of the bladder wall. No mucous membrane changes.

Ureters: Both the right and the left are markedly dilated.

Thyroid: The thyroid has undergone complete atrophy, so that no thyroid tissue can be found.

Brain: There is a marked thinning generally of the cortex, so that in its widest areas it is scarcely more than one-eighth inch in diameter. The sulci are shallow.

Pituitary: Appears normal in size and structure.

Anatomic diagnosis: Thyroid atrophy (complete); aortic hypoplasia; brown atrophy of the heart; angioma of the liver; bilateral renal calculi with hydronephrosis; pseudomembranous colitis; cerebral atrophy.

DR. WEISS.

The gross pathology of the case was as follows: The tongue was markedly enlarged and thickened (Fig. I, 1). The larynx was about the size of that of a child four years old. Epiglottis was small and its posterior surface was covered by a finely plicated mucosa (Fig. II, 4), which between the furrows is thickened, giving the appearance of pox marks. The aryepiglottic fold was coarsely plicated and deeply furrowed. The mucosa over the arytenoids was also markedly thickened and finely plicated, and at the base of the cartilages formed a cushion. The ventricular bands were enlarged and thickened. The vocal cords (Fig. II, 6) were markedly hypertrophied and leave only a narrow glottic chink. The thickness of the vocal cords is equal to that found in a larynx many times the size of this one.

The microscopic pathology of the larynx bears out the impression formed on inspection of the gross specimen. The thickness of the laryngeal wall is disproportionate to the height of the cartilage. The mucosa of the aditus ad laryngis and the ventricular band is markedly plicated and thickened, espe-

cially posteriorly. The thickening is due to a deposit of connective and myxoid tissue between the gland acini and in the submucosa. The glandular elements of the submucosa appear to be hypertrophied in some spots and atrophied in others. The redundancy of the ventricular band has on cross section the appearance of polyps. The fibers of the *m. thyroarytenoideus externus* are atrophied and lost in the ventricular bands. The vocal cords are markedly hypertrophied, due to large deposits of interstitial connective tissue interposed between the bundles of the *m. vocalis*, which must interfere with the action of that muscle, and due to the thickening of the submucosa. The sinus Morgagni is distorted and displaced by hypertrophy of the ventricular band and of the vocal cord. The hypertrophy, plication and redundancy of the mucosa give rise to polyp formation and to prolapse of the sinus. The tissues of the fossa pyriformis show the same type of changes.

This report deals with the findings in one isolated case. In how far the pathology of this case represents the typical changes of the cretin larynx remains to be determined by further study.

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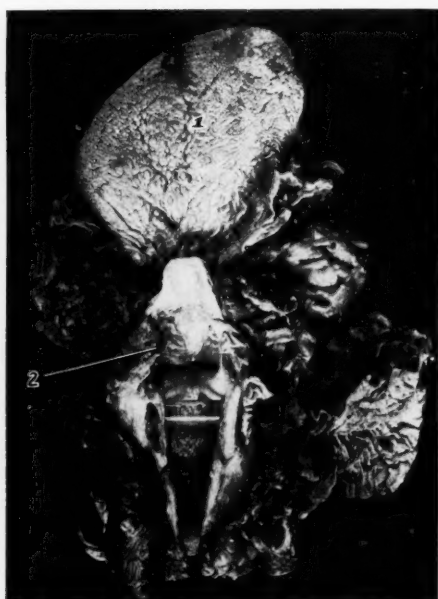


Fig. 1.

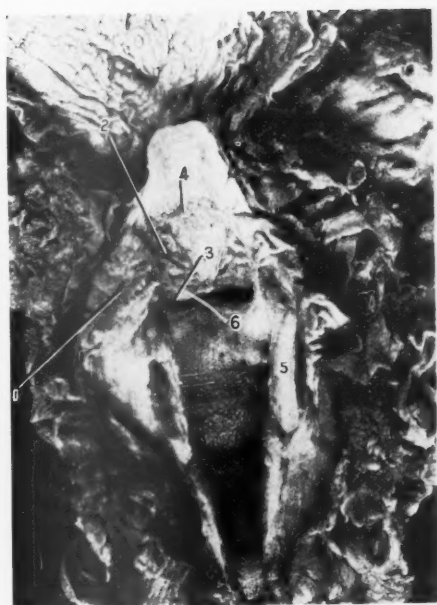


Fig. 2.

XXVI.

RECOGNITION OF SINUS DISEASE IN CHILDREN.*

By ROY A. BARLOW, M. D.,

MADISON, WIS.

The work of Dean and Byfield has stimulated investigation for the relief of sinusitis in children and has resulted in untold benefits for children suffering from "chronic colds" due to infection of the paranasal sinuses. A mental review of past histories in the light of our present knowledge has convinced me that many children have had sinusitis and the correct diagnosis has been passed by simply because of failure to recognize the condition.

During the past few years a great deal of interest has been evinced in this type of case and numerous articles have been written on the subject. The bibliography is quite completely covered by Dean and others, and so I will simply refer to their monographs.

Our attitude in regard to sinusitis in children is easily explained when we recall that it has never been impressed upon us that children possessed sinuses before they had reached the age of puberty. Textbooks simply mentioned the possibility of sinuses developing as indentations in the maxillary bones. Even the most recent texts on sinusitis devote only five or six lines to the possibility of sinusitis in children and add that the reported cases were really osteomyelitis and bone necrosis. Is it any wonder, then, that we were somewhat skeptical and backward in taking up this apparently paradoxical viewpoint?

When once one begins studying these cases they are found to present many interesting features, and it is indeed a revelation to see the enormous size some of the sinuses assume. The antrum may be present in infants as young as six months, and at twelve months or a little more it is quite well developed, as are also the ethmoids.

*Read before the American Laryngological Association, Swampscott, Mass., June 2, 3, and 4.

The maxillary sinus appears in the third month of fetal life as a small outpouching from the lateral wall of the ethmoid infundibulum. The neck remains small, and from the osteum the body enlarges to form the sinus proper, which is situated high in the maxilla and possesses a rather thick floor.

The ethmoids arise from grooves and recesses in the lateral walls of the middle and superior nasal meati. They are present in the latter part of the third and fourth fetal months; definite cells are found at the sixth fetal month with great variations, as demonstrated by Davis and Schaeffer.

The frontal sinus arises from an extension of the anterior and superior middle nasal meati, and is known as the frontal recess. It may be found in the third or fourth fetal month, but is usually recognized only after the third or fourth year of postfetal life.

Signs and Symptoms.—The acute attacks or manifestations of sinus disease in children are accompanied by the usual fever, general malaise, and so forth, and swelling of the external nose may or may not be present. Usually within three or four days the sinus ruptures intranasally, the pain and general symptoms are relieved and only the profuse nasal discharge remains. It is doubtful that the sinus ever returns to normal or, rather, that the infection ever entirely subsides. It is the opinion of some that once a normal sinus is infected it is always a potential factor in focal infection. In other words, a low grade residual infection of the mucous membrane lining continues and there remains a mild type of chronic suppurative sinusitis. It is this particular type to which I refer in this article.

The most prominent manifestation of chronic sinusitis is a mucopurulent discharge from the nose. It is quite profuse, is associated with vestibulitis and frequently with excoriation of the nares. The parents often state that the child uses several handkerchiefs a day. This, of course, gives the patient the appearance of having a head cold and he is treated for that condition. A considerable amount of discharge drops post-nasally, at the same time setting up pharyngitis and hyperplasia of the lateral bands, and may even go so far as to stir up inflammatory manifestations in the larynx.

The paratracheal lymph nodes take up the infection and may even produce symptoms of chronic bronchitis. It can be readily seen how simple a matter it would be to regard a child as suffering with a cold in the head or bronchitis, and in most of these cases treatment, including quantities of cough syrup and expectorants, has been given with little or no improvement. In many cases the symptoms are focal rather than local, as chorea, arthritis, iritis, nephritis, and so forth.

In addition to the above mentioned symptoms, it is reasonable to suppose there may be manifested later in life sequelae in the nature of hay fever, nasal asthma, polyp formation, and so forth. It is not altogether unlikely that some unexplained cases of bacterial sensitization may also be referable to a low grade infection in the sinuses. To be sure, we have no way of actually demonstrating this, but it hardly seems reasonable that an infection can persist for a comparatively long time without manifesting itself in some subsequent disturbance.

Diagnosis: The diagnosis is quite easily determined by the history, as stated above, the discharge of pus in the nose, vestibulitis in many cases, and pharyngitis. A very valuable aid, in fact, one which can not be eliminated, is the X-ray. A stereoscopic picture is preferable, but in tiny children it is not always possible to obtain satisfactory views. In such cases a single anteroposterior plate and a profile plate should be taken. In reading a flat plate one should not be misled by what appears to be a cloudy antrum without consulting the lateral plate, for frequently the permanent teeth may occupy such a position that they cast a shadow which is deceiving.

Treatment: Medical therapy in our experience has been of little value. In acute cases the condition is relieved by steam inhalations and instillation of 10 per cent argyrol or 1 per cent mercurochrome. This therapy simply shrinks the mucous membrane and allows temporary drainage and ventilation. Chronic sinusitis does not yield at all to this treatment. Removal of tonsils and adenoids should be done in an attempt to eliminate all irritative factors, but in our experience the sinusitis itself yields only after the antrum is opened and drained. This can be accomplished with an antrum punch under light gas anesthesia. It is sometimes well to open the anterior ethmoids. One should bear in mind that the floor of the antrum

is high, and the antrum trocar should be so guided as to avoid injury to the dental buds and other structures. Subsequent to this surgical procedure it is sometimes necessary to inflate the antrum even though gas anesthesia be administered.

SUMMARY.

There is no question of the existence of paranasal sinuses in children, and they are susceptible to infection. All persistent head colds in children should be investigated for sinus involvement. The diagnosis established, the most satisfactory results are obtained by surgical procedures as outlined above.

Many cases of sinus disease in children are neglected or overlooked. All were overlooked years ago, and it is not unreasonable to suggest that a neglected sinus infection in a child may be the etiologic factor in many cases of hay fever, nasal asthma and polyp formation in later life, to say nothing of its possibility as a focus of infection.

Note.—The author wishes to acknowledge his indebtedness to Dr. Milo Miller of the clinic at South Bend, Ind., in conjunction with whom these cases were observed.

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Fig. 1. X-ray showing size of sinuses in a child seventeen months old.

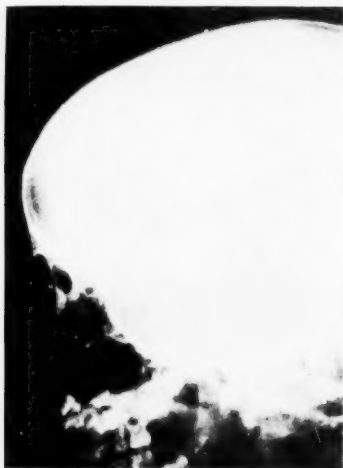


Fig. 2. X-ray showing the development of sinuses in a child five years old.



Fig. 3. Well developed sinuses in child of six. Definite infection in the left antrum.



Fig. 4. Bilateral infection more marked in the right.

XXVII.

REPORT OF A CASE OF CONGENITAL STENOSIS
OF THE LARYNX IN A THREE-YEAR-
OLD CHILD.

By CLEMENT F. THEISEN, M. D.,

ALBANY.

The patient, a three-year-old child, was admitted to the medical service of the Child's Hospital, during the past winter, for a difficulty in breathing that had been going on for some time.

I was asked to look her over by Dr. Winne, who had the medical service at the time. There was a discharge from both ears and nose. Pharynx was red and tonsils inflamed and moderately enlarged. No evidence of a membrane anywhere in the pharynx. The child was somewhat cyanotic, with a marked inspiratory stridor. The breathing, in fact, suggested the presence of a foreign body in either the larynx or trachea, although there was no history of that kind. It was impossible to make a proper examination, owing to the child's struggles, with a laryngeal mirror, so a little ethyl chlorid was given and a direct laryngeal examination was made. The laryngeal mucosa was very edematous, so much so that it was difficult to get the Jackson tube through. The child's breathing became suddenly so much worse that the instrument had to be withdrawn. The edema at this time was considered part of the infection of the throat and ears. Cultures for diphtheria were negative, the infection being a streptococcus aureus. The diagnosis of laryngeal stenosis was not made at this examination.

An ice coil was applied to the neck, at intervals, for several days with no relief in breathing. The child was again anesthetized and now an extremely tight stricture was discovered. The sketch of the larynx, drawn on a large scale, will give some idea of the laryngeal condition. I do not think I have ever seen quite such an extreme stenosis. The smallest Jack-

son tube I had, and the smallest bougies, would not go through, and in order to get the child off the table alive we finally had to stop. This was done at the time simply to make a diagnosis. I recommended to the attending physician a tracheotomy, followed by operative procedures in the larynx, while the tracheotomy tube was in place. He was anxious to have another attempt made to get a tube through before a tracheotomy was performed.

I did not want to try it again, and suggested that as I did not consider myself particularly adept in the use of Jackson's instruments, that Dr. Holding, who had recently started in Albany, after a course with Dr. Jackson, might be more successful. The child was again anesthetized, and while Dr. Holding was working suddenly stopped breathing. All efforts to bring the child back were unavailing. Dr. Holding was very skillful in his manipulations, and was in no way to blame for the unfortunate termination.

The autopsy showed very much the same laryngeal condition as my drawing of the larynx. The stenosis was so extreme and what was left of the laryngeal lumen so small that the smallest bougie would not go through. A careful search of the lungs failed to reveal any foreign body and were normal, with the exception of a slight pleurisy with effusion on the right side.

I cannot help feeling that the child's life might possibly have been saved if a preliminary tracheotomy had been performed before attempting any operative work in the larynx. I am sorry that the larynx could not have been removed at the autopsy, but that was out of the question without the consent of the parents. It was the most extreme case of congenital stenosis I have ever seen. I do not see how it could have been anything but a congenital stenosis.

I would like to report one other case, which I neglected to mention in the title of my paper. This case is reported more for its historical interest than for any other reason. Also to show the great difficulties we had to contend with, twenty-six years ago, before we had the beautiful instruments devised by our great master of bronchoscopy and esophagoscopy, Dr. Jackson, for the direct examination of the air passages and esophagus.

The older members of the association will, I am sure, recall very vividly the infinite amount of patience it required to treat tight strictures of the esophagus in children, often the result of swallowing washing fluid. Twenty-six or more years ago we were, of course, working more or less in the dark, largely by the sense of touch, and with instruments which we now think were more or less crude. I am not sure that we sometimes did not do more harm than good. I do not know whether Kohler's instruments had been invented at that time.

The case I wish to report is that of a four-year-old child, who was admitted to the Child's Hospital twenty-six years ago, shortly after I was appointed a member of the staff. The child's mother was a laundress, and one day when the mother was out of the kitchen the child swallowed a quantity of washing fluid which contains a considerable percentage of caustic potash. The bottle containing the washing fluid had been left on the floor, and the mother got back in the kitchen just in time to see the child drinking from the bottle. Difficulty in swallowing developed soon after, and when the child was brought to the hospital, a few weeks later, this was so extreme that only very small quantities of fluids could be taken. The smallest bougies I had would not go through. It was the tightest stricture I ever had to deal with, in the many years I have practiced our interesting specialty.

After daily attempts for some time, and the child growing weaker all the time, I asked one of our surgeons to perform a gastrostomy, and, while the child was being fed through the stomach wound, I had Meyrowitz make me a long, almost round whalebone bougie, with a small olive shaped metal head fastened to one end. The piece of whalebone was not any thicker than rather heavy twine, and the metal end about the same size.

After great difficulty we finally succeeded in getting this past the stricture, which was located at the usual point, about ten inches from the teeth or about at the cricoid. The end of the piece of whalebone was brought out of the gastrostomy wound and a piece of strong silk cord, long enough to come out of the mouth, fastened to it. We then carried out an up and down and side to side sawing motion, which was repeated several times, at intervals of a few days. To make a

long story short, we finally were able to use larger bougies and, after a couple of months, closed the gastrostomy wound. The child was given olive oil each time the stricture was dilated and for several days after. The mother was taught to pass the bougies, and I kept the child under observation for about ten years, seeing her from time to time. The bougie we were finally able to use was almost the normal size for the child's age.

I mentioned the fact that sometimes a good deal of harm was done in those days by unskillful manipulations of the esophagus.

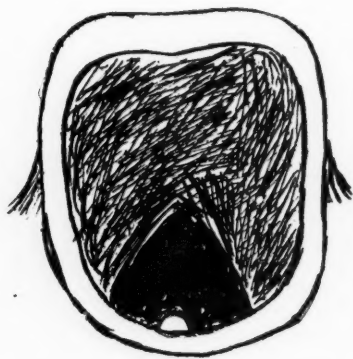
About the time we were struggling in the hospital with the case just reported, a child in a small town near Albany swallowed part of the breastbone of a chicken, which lodged in the esophagus. The country doctor passed some kind of an instrument down the esophagus, with the idea, I suppose, of pushing the bone into the stomach. He did not succeed in pushing it into the stomach, but did force it into a large blood vessel, and the child promptly bled to death.

We certainly owe a great debt to Jackson, Killian and other pioneers in esophagoscopy and bronchoscopy, for the vast advance in methods of treatment, and particularly for the instruments for the direct examination of the esophagus and air passages.

Referring again to the case of laryngeal stenosis. Most of the cases of stenosis in young children are in all probability caused by congenital syphilis. Adult cases are frequently the result of tertiary lesions in the larynx, particularly if the primary disease was not treated vigorously enough and the patient not kept under observation long enough.

The stenosis in the writer's case was not the usual picture of a cicatricial stricture, such as we often see. The entire larynx was filled, uniformly on both sides, with a mass as hard as cartilage. I do not recall ever seeing a case of congenital malformation of the larynx.

I do not know whether cases have been reported, as I have not looked over the literature. I might add, also, that the reason a foreign body was at first suspected was on account of a slight bronchopneumonia, which developed soon after the child was admitted to the hospital.



Dr. Theisen's Case of Congenital Stenosis of the Larynx.
Three-year-old child.

XXVIII.

THE SEPTUM-ETHMOID COMPLEX IN RELATION TO CHRONIC CATARRHAL OTITIS MEDIA.*

BY JAMES A. BABBITT, M. D.,

PHILADELPHIA.

The title "Septum-Ethmoid Complex" has perhaps been appropriately selected to clothe a new avenue of approach to a time honored field of otorhinologic research, and one usually relegated to as discouraging finality as Metchnikoff's deferment of old age. Indeed, the analogy may be too precise, and the rather hopeless and unattractive field of chronic catarrhal otitis media may be inevitably so. The work, however, presented by Fraser on ear pathology, Bordley on intratubal treatment, Emerson, Pemberton and others on focal infection, the splendid advances in allergic science and audiometric measurements, the records of a host of others in the cumulative results of patient clinical routine, must stimulate the belief that something of increasing value will soon come to relieve the vast army of insidiously deafened ears, for which we still afford but little relief. This paper will briefly consider again the intra- and postnasal influences in contribution to tubal obstruction of catarrhal otitis media and open again the discussion as to justifiable aid in the restoration of normal air currents.

Certain fundamental facts would seem to obtain:

1. The etiologic factors in middle ear deafness form a complete syndrome involving physical, physiologic, pathologic and perhaps psychic influence.
2. The process is insidious, both in onset and progression, and its study, to be of value, must be upon subject material during a still formative, perhaps preventative, stage—groups of patients not far abnormal. If advanced pathology be once established, its service is merely one of partial repair and retardation.

*Read before the Section on Otology and Laryngology of The College of Physicians, Philadelphia, April 16, 1924.

3. The extra-, intra- and postnasal diagnostic picture in a multitude of patients suggests a vitiated respiratory channel and raises the query of potential liability. To be frank, has the oft abused expression "suction pull on the fossæ of Rosenmüller" any proved basis in fact?

4. The relation of cause and effect of abnormalities in the picture is not at all established. In the triumvirate—septal deformity, turbinate degeneration and postnasal block—the priority of influence is often but a matter of opinion, and in the septum at least involves embryologic, developmental and traumatic factors. In these days the fallacy of removing tonsils simply for cure of deafness is well established, but one might note parenthetically the surgical roster still attests the rapacious appetite for tonsil collection.

5. While X-ray findings as well as laboratory culture for focal infection are subject to wide variation in interpretation, and the personal equation is important, in composite review of a large number of these, one is impressed with the exudative evidence in the ethmoid area and its coordination with septal pressure. Is not this a more important factor than is usually rated in the development of lymphatic hyperplasia in the pharyngeal end of the tube?

6. The economic efficiency significance of the "deafened" problem, unless one submits to the Osler dictum, has not met the parallel attention accorded tubercular, malignant, specific, ophthalmic and allergic problems. If recent investigations suggest more optimism, concerted effort is demanded for widespread survey of the deafness status, uniform criteria of measurements and tests, establishment of preventive measures in the educational age. This is up to the otolaryngologists, who alone can accomplish it.

For the purpose of this paper, three groups will be considered: first, patients operated for relief of tubal trouble, in whom the septum-ethmoid complex seemed a justifiable factor; second, nonmedical subjects selected for purposes of analyzing the correlation involved in an intranasal picture of undue septum-ethmoid proximity, and, third, a few selected X-ray plates from a series taken by one operator, which demonstrates septal-ethmoid interaction, all but one of whom were justifiably operated (this one somehow escaped and was oper-

ated on elsewhere). Dr. Pfahler, who took this series in course of routine examinations, and with no relation to their demonstration, will present lantern slides of plates in question.

1. The writer has felt for some time that in a case of election to relieve an upper nasal involvement the surgery should of choice be septal. A well operated septum, with proper drainage and properly preserved flaps, ought to be unattended by danger and leave a comparatively normal anatomy, and experience seems to have shown that a certain percentage of troubled ethmoid areas will return to normal drainage when pressure is removed and air current reestablished. Certainly a well healed septum presents a better picture than a mutilated turbinate base and less offensive crusting. In comparison of septum and ethmoid operations of all kinds and degrees, the former approximating 1,000 operations, the only two intracranial complications were ethmoidal. The comparison, however, is hardly fair, as these two were "in extremis."

The case records represented three types: first, cases of simple stuffiness of tubes—retracted tympani with occasional periods of tinnitus; second, those of marked general deformity, internal and external, and, third, those of ordinary septum-ethmoid complex associated with advancing tubal obstruction, deafness and tinnitus, practically disabling the patient.

The results ranged from no relief whatever, and possibly in two or three cases evident detriment, to complete relief of discomfort, an apparent increase in patency of tube, improved hearing and relief of tinnitus. We shall refrain from presenting series of these cases, about fifty in number, because subsequent case records are incomplete, time periods are at variance and measures of improvement are not accurate.

Citing a favorable case in each group, first, Mr. R. T. H., professor in a near by woman's college. Treatment of local and general reconstructive type for one and one-half years, totally ineffective; submucous operation on septum entirely relieved stuffiness and tinnitus; continued comfort reported for three years, until patient accepted a position in California. Second, Miss L. B. S.: Consultation about twelve years ago for general rhinopharyngeal involvement, rapidly increasing deafness, tinnitus; patient psychically, at least, becoming unfitted for vocal supervisor's work in a high school system.

Three operative procedures were done in two stages, external correction for a marked deformity, separating nasal processes of superior maxilla, later submucous for a high posterior deflection and with intervening vertical strip of cartilage undisturbed, correction for displaced columnar cartilage. After twelve years patient semioccasionally visits office for intratubal treatment, but hearing improved and effective in musical work. Third, Rev. Dr. F., age 60, about to relinquish preaching because of a complete deafness in one ear, marked roaring tinnitus, badly stuffed nose with vertical deflection of the septum. Treatment somewhat effective but inadequate. Operated on June, 1923, submucous resection of septum and a portion of ethmoid removed. Returned in December—remarkable change. Tinnitus practically gone, hearing tests in more favorable ear had increased 100 per cent, and in the deaf ear had come up to a definite appreciation of sound in all three fork ranges. He complained of some vertigo which sent him to the office. An internist soon convinced him that this trouble was due to over-eating. These are, of course, the good cases. Many show little or no help, but is not the effort justifiable, and may it not retard backward progress?

2. For the purpose of this paper an attempt was made to study a group of cases representing on inspection examination, reasons for suspecting insidious changes influenced by the septum-ethmoid relation. For this study cases must represent a controlled group, whose responses would be accurate and who could be estimated under an equal condition. They must represent essentially non- or semipathologic conditions, at least those whose ear changes are not far abnormal. The records and statistics of office practice would scarcely suffice, as this represents a balance of well advanced pathology, and we are studying only incipient underlying factors.

The array of school examination material is only indicative, can scarcely be controlled for scientific investigation, and hearing tests are wholly unreliable. Again, our dispensary patients cannot be depended upon for uniform examination, as they would not voluntarily assist, and furthermore represent advanced pathology. Perhaps the most available material would be represented in the army, large business organizations, plants with official medical direction and the higher educa-

tional institutions, with patients of controllable age and adequate medical supervision. Of these available groups, the collegiate has the advantage of regularly published reports of infirmary service, with a background of repeated physical examination and constant routine observation. One is also impressed with the apparent fact that from 60 to 75 per cent of the routine medical treatment here is for involvement of the upper respiratory tract, so this affords an opportunity of unique correlation in this field. For the purpose of this topic, an effort was made to make a parallel investigation of a small series of these cases, recorded as presenting a marked septal error. From a group of 85 so recorded, an initial series of 30 was selected and, with the able cooperation of scientific assistants of ability, who aided in device of apparatus, the recorded series of tests were taken. The subjects were not recorded as deaf, except in three unilateral cases accidentally included. All represented a possible septum-ethmoid complex, and, while the list is too small to represent any real proof and the results may mean nothing, they are at least suggestive and indicate an effort to approach this from an unusual angle. The procedure follows:

First—The writer examined each case intranasally and rated the picture arbitrarily from first to fifth degree in variation of ethmoid pinch.

Second—Functional tuning fork tests, A:50, A:200 and C:2000 with Rinne and Weber variations were taken. This, of course, was nearly uniformly normal, but even slight variation was similarly rated in the five degrees.

Third—The watch test for distance was next taken, as distance available did not favor voice and whisper test, and these were similarly rated for each ear.

Fourth—By a simple type of electric transmission, with telephonic earpiece receivers, the fine perception difference of the two ears was recorded on a 500 vibration tone. This was simply to detect any difference between the two ears, and was so slight as to mean nothing in most cases; nevertheless, they were rated for comparison.

Fifth and Sixth—Two methods were devised to measure the relative air currents in the two sides of the nose, one based upon aqueous vapor condensation and weight of water ob-

tained, and the other depending upon carbon dioxid reduction and titration with barium hydroxid—both to determine the relative amounts of air exhaled from the two sides. As a matter of interest, and because it was possible, leucocyte differential was taken by Dr. Taylor in each case, but this has no significance in the comparison. These devices, with their originators, are represented on the charts shown, but in present form are too tedious for routine service, nor is it conclusive that either intranasal picture or bilateral movement of air has any valuable interpretation. They have, however, the simple advantage of being rated absolutely independently, both as regards test rating and subject.

So the curves platted and shown in charts, inaccurate as they may be in abscissa unit, are unbiased, and are at least interesting and might stimulate more conclusive tests.

The deductions are certainly unique. First, the composite evidence indicates considerable conformity in lateralization of functional, Weber and audiometric tests, at least a 75 per cent conformity. Second, the condensation and carbon dioxid tests coincide in a considerable majority of instances. Third, and this is striking, the rating of observed intranasal picture does not coincide in any degree with the actual air movements recorded by the other tests. The writer's estimate may have been at fault, or too hasty judgment made of various anatomic intranasal features, or, on the other hand, as suggested by McHenry, the lateralization of hearing, intranasal picture or capacity for moving air may mean nothing. This, however, will be disputed in the results of operative interference suggested by the X-ray plates to be demonstrated by Dr. Pfahler and accompanying this paper.

We do venture this assertion, however: It would be entirely possible to devise simple means for registering the bilateral nasal caliber in thousands of cases: for correlating this with tubal indications in as many: and justifying greater or less attention to similar processes, when such would be of value, in incipient conditions. According to Fraser, "We know how often inflammatory affections of the head lead to bone disease of the turbinals, cases of nasal polyps and ethmoiditis," and, according to Bordley, "that lymphoid tissue is a normal constituent of the tube and that its cells infiltrate the tunica propria

of loose connective tissue below the mucous membrane, thus giving rise to true adenoid structure." "It seems, undoubtedly, to react to such stimulation as catarrhal and infectious processes in the nose and throat," etc.

The reproduction of the X-ray examinations accompanying this were determined by Dr. Pfahler and are self explanatory. The exudative pictures in the series are taken from routine cases whose very evident septum-ethmoid relation warranted radiographic examination, and will in a measure justify the purpose of this paper and stimulate discussion.

The chronic deaf deserve the expenditure of real research effort toward the relief of blocked eustachian tubes and the possible relief of subjective noise. Their famished response to possible X-ray and osteopathic relief deserves our attention, and the sociologic syndrome is too important to be overlooked.

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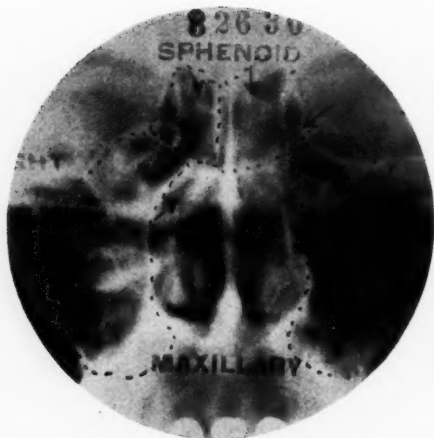
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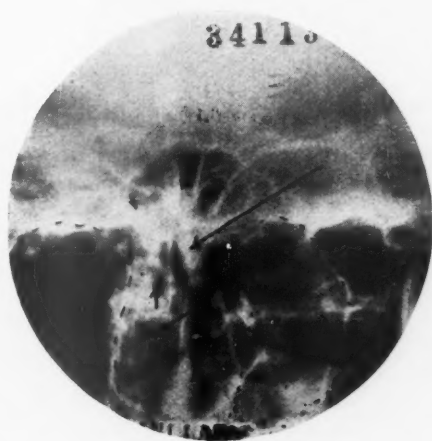
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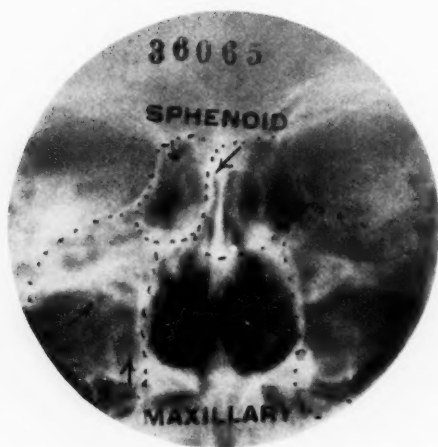
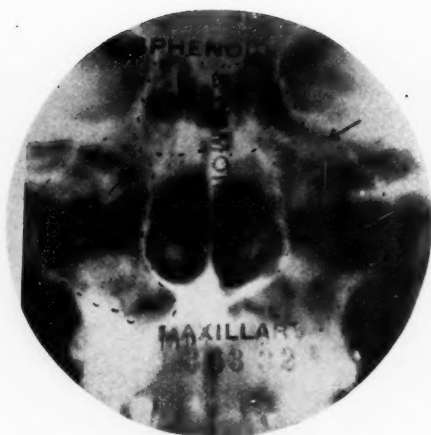
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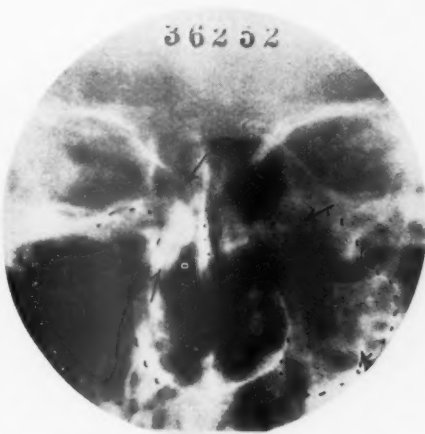
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XXIX.

THE PRESENT STATUS OF ELECTROTHERAPEUTIC MEASURES USED IN THE PRACTICE OF OTOLARYNGOLOGY.*

BY JOSEPH C. BECK, M. D., AND HARRY L. POLLOCK, M. D.,

CHICAGO.

In recent years many articles have appeared in our leading journals dealing with subjects closely allied with that which we are presenting today. Naturally most authors present an optimistic outlook because they usually give their results with one and only one of the various methods under discussion today, as, for instance, diathermia, ultraviolet rays, X-ray, etc. Others have followed their methods, but apparently do not obtain satisfactory results and early discard these procedures, stating that they cannot procure the good results outlined by the original author. Most of these failures are easily understood.

While we are primarily otolaryngologists, very few of us have studied the physics of electricity or really know anything of the physiologic effects of the various currents used. We may not know that a slightly larger dose of some currents will have an opposite effect from a smaller dose. In the larger hospitals and clinics, where there is a medically trained electrotherapist in charge of the various appliances, one can expect better results than where individual otolaryngologists must apply the treatment. For example, a new electric appliance may have been used successfully in a large clinic and the results published in a journal of standing. Immediately there is a demand for such an appliance from various physicians throughout the country, who may know very little of the forms of electricity used. With limited information they are compelled to work out their own method, which, on account of a lack of knowledge of the essentials of electrotherapeutics, often ends in poor results. Another cause of failure lies in the fact

*From the Clinic of Drs. Beck, Pollock and Lederer, Chicago.

that the manufacturers of these various devices, in order to effect a sale, usually claim highly successful results and cures in many pathologic conditions. Frequently claims are made which we know to be impossible. Physicians who have bought the apparatus, often at a considerable expense, may be tempted to treat all sorts and varieties of conditions so as to reimburse themselves in part for the original outlay.

At present we might say that we are living in an electrical age, as nearly all the modern improvements of our daily life are due, in one form or another, to electricity. So, too, has the electrotherapeutic advancement been made, and each day brings forth something new in this field.

Some of the older currents, which have been used for years, are well known to all of us, as is their limited application. It is not the purpose of this paper to delve deeply into the history of the various forms of electricity which have been or are now being used, as that phase would take up all the time at our disposal. The types of electricity used most extensively in early modern medicine were the galvanic and faradic currents. The galvanic, the direct or continuous current, is a low tension one. Its use in living tissues is always productive of marked polarity effects in the tissues immediately adjacent to the electrodes. The faradic is the alternating or broken current. The principal uses of these two currents are: (1) to stimulate muscles, (a) those in which the controlling nerve has been destroyed, and (b) those atrophied from disuse; (2) to test muscles for reaction of degeneration. To summarize, the following results occur in testing muscles: If a galvanic current, with one electrode applied to the muscle, the other at any indefinite point, is suddenly switched on or off, muscular contraction occurs. The negative or kathode is the most active in closing the current (KKC ACC). The positive or anode is the most active in opening the current (AOC KOC). The nutrition and tone of a muscle fiber are governed by nervous impulses originating in the motor nerve cells situated in the anterior horn of the spinal cord, and if these are cut off the muscle undergoes degeneration. This reaction of degeneration was first described by Erb in 1868. In testing, we find that there is absolute loss of all response to stimulation by the faradic current because faradism only stimulates the nerve.

The muscles respond to interrupted galvanism by a slow, sluggish and long continued contraction which passes off gradually. In normal muscle the kathodal closing contraction is obtained more readily than the anodal closing contraction. In most cases of degenerated muscles this is reversed and the ACC is obtained first. If the anode C. C. gives a response with a less current than the kathode, diagnosis of the reaction to degeneration is made. The use of the galvanic in our hands has been exceedingly useful in determining this reaction of degeneration, and secondly, in stimulating the muscles to prevent them from degenerating. This is especially true of the muscles supplied by the facial nerve, whether the nerve has been destroyed by surgical procedure, by lues or by a peripheral neuritis such as Bell's palsy. The faradic is of use in stimulating the nerve only as stated before; it has no action on the muscle itself.

A sinusoidal current is one, the voltage tracing (oscillograph) of which resembles a sine or segment of a circle. The rapid sinusoidal current is the ordinary commercial alternating current, and voltage tracing of it would show as many positive and negative sines as there are cycles per second. A cycle is one complete positive and negative phase. A slow galvanic sinusoidal current is the straight galvanic current modified by being run through a constantly and evenly varying resistance which is so constructed that each succeeding wave is of the opposite polarity to that of the preceding one. We employ the rapid sinusoidal current in stimulating relaxed or atonic muscles where no reaction of degeneration has occurred. Where this has occurred we employ the slow sinusoidal, because of fear of overstimulation, which would weaken the muscle more and more, and thus our end results would be disastrous. Thus it can be seen that the theory of physics must be understood in order to obtain the best results.

High Frequency.—This is a current having a frequency of oscillation measured in the hundreds of thousandth or millionth of a second, usually anything that is above 30,000 oscillations per second—i. e., having such a high rate of alternations that living tissues do not attempt to contract under each impulse (Sampson). There are two forms employed in medicine, the general and the local. The general is never employed in

otolaryngology excepting for a general metabolic action. General high frequency (autocondensation) gives the following results: Increased activity of metabolism and lower blood pressure. In local application of high frequency, sweat and mucous glands are stimulated. Moderate vasodilatation and local hyperemia occur. The results are that painful conditions are eased and inflammatory exudates resolved (J. Magnus Redding). The local high frequency is applied to any part of the body, but in our hands we have not seen any benefits (except, perhaps, the psychic), and therefore do not recommend its use.

Leucodescent Heat and Diathermia.—According to Sampson, there are three kinds of heat employed as therapeutic measures: (1) Conductive, (2) convective, (3) converseive. Conductive heat is heat applied to the body by continuity, for example, hot water bags, mud packs, electric pad, etc. Convective heat is heat thrown on to the surface from some outside source, such as superheated air from electrically heated coils, etc. Converseive heat is energy converted into heat in the tissues themselves by virtue of the resistance of the tissues to the passage of oscillatory high frequency or heat waves through them. We have been using convective heat for some time, in the nature of a leucodescent lamp. This heat is produced by a 500 watt electric bulb encased in a metal globe, the outlet being rather small, so as to concentrate the heat in one place. Most of the manufacturers of these various types of lamps insist that it is not only the convective heat which is beneficial, but in addition we obtain actinic or ultraviolet rays, which play a great rôle in the therapeutic results. We do not look upon the small amount, if any, of actinic rays as playing any rôle in the use of this form of heat. We have had exceedingly grateful results with this lamp in the treatment of acute sinus infections, acute otitis media, acute cellulitis, gland infections and also in furunculosis. Given a twenty-minute treatment with the lamp, we know of nothing so sedative or soothing in these acute sinus infections. We have seen beginning acute otitis media, where there is marked redness of the drum, pain, etc., disappear with one or two treatments. The infection of furunculosis disappears much more quickly, and the pain occurring is less severe where this form of heat is

used. We can recommend it very highly for a palliative treatment in these acute infections. We do not, however, wish to infer that all cases of sinus infections or otitis media can be cured by this treatment—far from it, but it has its use as described.

The third form of heat employed is the converse heat and this is known as diathermia. This is divided into two classes: (1) Diathermia, (2) electrocoagulation or surgical diathermia. Diathermia consists of two forms (a) sedative, (b) stimulative. The sedative technic is employed, if a high degree of heat is desired, an intense hyperemia, an absorption of effusion, relaxation of muscular spasm, relief from the pain of a neuritis, sterilization of some chronic suppurative process. If it is desired to stimulate, repair, irritate and stir up an intense inflammatory reaction, then the stimulation technic should be used. The details of the technic are not within the province of this paper, but can easily be obtained from any textbook on electrotherapy. It suffices to state that we have employed it quite frequently for neuralgias and pains from various other causes. Here, too, the effects are very grateful, and its use is recommended for palliative treatment of neuralgias and to stimulate absorption of chronic inflammatory products. In surgical diathermia we employ a much stronger current. The important method is a bipolar application of low tension, high frequency currents of sufficient milliamperage to coagulate and devitalize the tissue in the neighborhood of the active electrode. We employ a larger indifferent electrode and a smaller active one. The effect is coagulation necrosis. The active small one is employed in two ways, viz., (1) a small flat electrode is applied to the tissues to be destroyed, usually superficial nonmalignant growths of the skin, and (2) a sharp electrode or needle, which can be plunged into the tissue whence a coagulation necrosis occurs in the surrounding tissues as deeply as the needle is inserted. We have used this method in destruction of stumps of tonsils and in one case—hemophilia—complete destruction of the tonsil. This method is slow and painful, and we have discontinued its use, finding that surgery gives far better results. In malignancies it is of very little value except to deodorize and disinfect the area; we have also discontinued its use in these cases.

Along this same line of destruction of tissues is fulguration. This is produced by large and powerful sparks from any high frequency machine. The indifferent electrode is placed anywhere, and the electrode from which the sparks are emitted is applied close to the parts to which destruction of tissues is desired. This destruction of tissues is merely superficial, as it has no effect upon deeper structures. The only application we have made of fulguration is in the larynx after removal of benign growths, especially in multiple papilloma. In our experience the recurrence is about the same, whether we make applications to the base of these papillomata, fulguration, electrocautery, alcohol or any chemical cautery, or whether we apply nothing at all. Hence we have thrown it into discard.

Endothermia or radiofrequency is nothing but a high frequency machine, the oscillations of which run into the millions. It is produced by the same instrument which transmits radio messages, hence the name. It is used somewhat like surgical diathermia, except that the small electrode does not coagulate the tissues but cuts through them. An indifferent large electrode is placed anywhere on the body, and the smaller one, the knife, is used as an ordinary surgical knife. The knife, when in use, is cold in the ordinary sense of the word, but it sears sufficiently to close all but the largest blood vessels. Our experience is limited to two cases, one a carcinoma of the tonsil and the other a carcinoma of the tongue. In the former case the mass was resected without any bleeding, very little after sloughing and with a very quick healing. In the second case we did a resection of half of the tongue with excellent results. These two cases are too few to enable us to speak authoritatively of its use, but nevertheless this method is worthy of a trial.

The Percy electrocautery consists of a number of sizes of tips, which can be heated electrically to various degrees of heat—i. e., from the glowing red to the white heat. The action produced by these tips is not electrical, but that of intense heat applied to the tissues, which causes a coagulation. We formerly used this method quite extensively in the destruction of malignant growths. The reaction is intense. It has no selective action upon new tissue growths, and when used destroys the normal as well as abnormal cells. The author of this method,

Dr. Percy, advised the use of cold water jackets to control the heat and keep within the limits of its application, which we have always used, but found that its action did not control the heat. Our results with this method, as far as a cure is concerned, are absolute failures, and we have also dispensed with this method except as a palliative agent.

The electrocautery, so well known to all rhinologists and used by them for cauterizing hypertrophied inferior turbinates, ulcers on the septum or bleeding points anywhere, is on the same principle, i. e., by use of electricity the tip is raised to any degree of heat, and the results are due to the coagulative necrosis produced by the heat employed and not to the electric current. This instrument is of great benefit if used properly, and in selected cases we employ it with gratifying results. The use of the galvanocautery has for years been abandoned for cauterization in the upper straits of the nose because of the complications which may arise from its use. However, realizing the heresy of such an act, one of our young associates (F. L. L.) has employed it extensively in fifty instances of strictly polypoid cases, where radical removal of the middle turbinates and a thorough exenteration and re-exenteration of the ethmoid cells have failed to check the recurrence of the polyps. These cases are purely those of the nonsuppurative, hyperplastic variety. Those cases of meningitis following cautery of the middle turbinate (thrombosis of the ethmoid veins) were operated on under different circumstances than ours, namely, in the presence of a chronic supuration. Therefore, after careful consideration, our observations indicated that many sequelæ and complications which have been ascribed to this form of procedure are due to entirely different causes, and, at the most, this procedure may have had only a determining influence. We feel that, by the improved technic and the careful selection of cases, this method may come into use again. However, fearing that its indiscriminate use may lead to mishaps which would again discredit this operation, we are working up to a larger series of cases and will subsequently present it in detailed form.

The Electric Pulsator.—There are various types of these instruments and, as we have used only one kind, we must give the results of our observation with this particular machine.

All are based on the same principle, viz., an electric contrivance which creates a sort of buzzing sound. This is conducted to the ears by two rubber tubes like a binaural stethoscope, the ends placed in each external auditory meatus. At the same time there is a Politzer bag connection which the patient compresses, and this tends to mechanically vibrate the drum membrane. The electric buzz is supposed to stimulate the terminal fibers of the eighth nerve and thereby assist the hard of hearing individual to improve his hearing. In our experience, and we have tried it in many cases, not a single patient was benefited by this treatment in itself. As a psychic influence in some cases it may have some beneficial result.

Vibrators.—There are many varieties of these instruments in use today, most of which are operated by electric power. They are often used as an adjunct to some form of electric treatment, but in themselves have given us very little therapeutic results.

Ozone is a strong irritating gas, made by passing a current of air over a high voltage generator. It cannot be used in otolaryngologic practice without combining it with some volatile oil. We employed it for several years and, while we obtained some good results, it has gradually passed into disuse.

Electrolysis.—Having had such poor results in the treatment of deafness resulting from chronic adhesions in the middle ear, we decided to try nascent iodine in the hope that it might soften and absorb some of these adhesions. Knowing that the negative pole of a galvanic current has an affinity for iodine, we placed a saturated solution of iodide of potassium in the external ear and an insulated copper wire electrode (positive) through the eustachian tube and turned on a mild current. This broke up the K. I., and by the starch method we determined the presence of iodine on the copper electrode. After trying this in a number of cases, without any results, we abandoned this method of electrolysis.

We now come to another important phase of electrotherapy, viz., the light therapy. This form of therapy is the first ever used by mankind, for, since the beginning of time, the sun with its beneficial rays has been with us. It was formerly thought that all rays were of equal length and strength, but Dr. Hertz in 1877 discovered long invisible waves. These are now being

used for the transmission of radio messages. If we split a ray of sunlight into its component parts, we find that they are divided according to their lengths. The infrared, which are not visible, are at one end of the spectrum and are the longest; then come the orange, yellow, green, blue, indigo, violet, which are visible, and lastly, the shortest of all, the invisible ultraviolet or actinic rays. In other words, the infrared—the longest waves—are the rays which produce heat. The others are the visible spectra, and the ultraviolet, the shortest and also invisible, is the one which is of greatest therapeutic value. Finsen, a Norwegian, in 1893, was the first to make therapeutic use of the ultraviolet or actinic rays. This method was, however, very crude as compared with any of the modern quartz lamps. He obtained his actinic rays direct from the sun, but the shortest and most powerful ones were absorbed and did not reach the patient. There are at present two methods employed in using these actinic rays generated by a mercury lamp, one by which a large portion of the body is treated at once. This is done by the air cooled lamp. The other is where more local application of the rays is desired. This is done by the water cooled apparatus with various quartz tips. It has been shown that quartz will absorb fewer rays than almost any material which we can use. In using these quartz applicators we must be sure that they are not bent more than 45 degrees, since the majority of the rays are lost. They travel in a straight line, but will follow the quartz applicators if not over a 45 degree angle. In the beginning we were told that the rays going through the applicators are given off along the quartz, but it was soon discovered that they emanated only at the tip. The actinic rays have a penetration of only one or two millimeters below the skin or mucous membrane, for they will not penetrate through blood. The application is followed by two reactions, the local and the general. The local is manifested by varying degrees of erythema and the general by various blood chemistry reaction, the sum total of which may be said to be decidedly beneficial in many morbid states. It has been demonstrated that the effect of the short waves is very bactericidal. The actinic rays are being used by electrotheraputists in many pathologic conditions, and most of them are reporting gratifying results. Our attention was called to its

use in otolaryngology by a paper published in the Journal of the American Medical Association by Drs. Novak and Hollender. They reported upon a number of pathologic conditions, principally hyperesthetic rhinitis, hay fever and asthma. Their investigation shows that there is a lack of blood calcium in these individuals, which can be brought back to normal by the ingestion of calcium lactate and small doses of thyroid extract. As soon as the calcium intake was discontinued, the patients began having their former symptoms. In order to stabilize the blood calcium they were treated by actinic rays over a varying period of time, and the results were then made permanent. We installed a quartz mercury lamp and have been using it since. One of us (P.) treated about twenty-five cases of true hyperesthetic rhinitis by this method. They were all given thirty general actinic treatments—most of these cases were from one to five years' duration. In all of these patients the clinical symptoms disappeared completely and only in one did a recurrence appear. This came on suddenly, about six weeks after treatment was discontinued, just as severe as ever. The patient was again placed on the treatment, and after twelve exposures all clinical symptoms cleaned up and have remained so to the present time. It is now seven months since the first patient completed the treatment, the last one only a month ago. True, sufficient time has not elapsed to say that a permanent cure has been effected, but in none of them was there ever remission for so long a time. The treatment has been very efficacious in treating furunculosis, either of the ear, face or neck, as usually one or two exposures to the water cooled apparatus will abort them completely. If they are fairly well established, it will hasten the recovery. We have said nothing concerning the pathology of hyperesthetic rhinitis before and after treatment, but have given only the clinical results. We have used the rays in suppurative sinus conditions, preoperative as well as postoperative, and have had all negative results. In a few cases of asthma and hay fever, the local as well as general actinic treatments have been a failure.

Infrared Rays.—These are the long, invisible rays which are being used for the purpose of disinfection in deep tissues. Their penetration is considerable, in contrast to the ultraviolet or short rays. In other fields of medicine, good results are

being reported, but our experience has been too limited to make any definite statement as to its efficacy.

X-Ray.—Regarding the use of these rays in diagnosis and treatment, volumes have been written and it would be useless to burden you at this time with the pro's and con's of this subject. One has but to scan the literature to find glowing results from one authority and condemnation by others. As to its value in diagnosis, we must state that it is probably the most useful laboratory adjunct in the history of medicine. However, we must not lose sight of the fact that it is an adjunct only, and often is at variance with our clinical manifestations, and when this does occur we must lean toward our clinical diagnosis and not depend entirely upon our X-ray interpretations. Even in our own field its use is so valuable and extensive that we could not begin the discussion of its manifold usefulness without writing volumes. The rapid advancement of otolaryngology as a special field in medicine has, no doubt, in a great measure been due to the use of X-ray in diagnosis. As to its therapeutic value, less enthusiastic reports have resulted than we had anticipated, and although we still employ it in some pathologic conditions in which good results are obtained, cures from its use are few and far between. In former years our great hope of its curative power was in malignancy. But we have been disappointed, even with the use of the shorter rays or deep therapy emitted from powerful machines. We know that its action upon embryonal cells is also destructive in nature, but when used in sufficient dosage it also destroys healthy tissue and ultimately destroys the patient. In our personal experience, the result in carcinomas is of some value. Occasionally it changes an inoperable case into an operable one, but rarely so. We employ it in preoperative and postoperative cases, in the former to prevent a spreading of the cancer cells which often occurs in operative procedures; in the latter, to destroy any few cells which have migrated beyond the operative field. In our experience we have never seen a single case of true carcinoma cured—i. e., when there was not a recurrence or a metastasis. In sarcomatas we have seen good results in a small percentage of cases. Some few patients have completely recovered and thereafter have been free from recurrences. In papil-

loma and surface epitheliomas, we have had many excellent results, but it is not a specific in these conditions. In treating hypertrophied and diseased tonsils, while the size may be decreased by destruction of the lymphoid portion, no relief has ever been obtained from the general symptoms due to a focal infection. We have also made use of the X-ray in treating deafness, but with absolutely negative results.

In conclusion, we believe that electricity and rays of the types enumerated above have a distinct value in our therapeutic armamentarium, but their action must be thoroughly understood. The cases must be selected, and it must be remembered that one type or one machine is not a panacea for all ailments.

XXX.

SOME OBSERVATIONS ON CERTAIN FORMS OF
CHRONIC SINUSITIS.

By ROSS HALL SKILLERN, M. D.,

PHILADELPHIA.

In using the term chronic as applied to diseases of the accessory sinuses of the nose, to just what condition do we refer? Is it to one that has continued for a long period of time, with little change as to its symptomatology and with no especial reference to its ultimate termination, or is it to a condition that implies a permanent pathologic change, with little hope of spontaneous recovery, regardless of the length of time the inflammatory process has continued?

The word chronic takes its derivation from the Greek word *chronos*, meaning time. We would then infer from this that our first interrogation was correct, and that when speaking of a chronic sinusitis, the viewpoint of length of time was implied rather than reference to the actual pathologic condition of the sinus mucosa.

You will immediately say—True, but one condition presupposes the other. When an infective process continues for a certain length of time in an accessory sinus, the mucosa reacts in such a manner as to permanently change its character. In other words, the passage of time and permanent pathologic changes in the mucous membrane are synonymous. Well now, are they? Does the presence of certain symptoms of a chronic nature always mean that the infection must of necessity have been continuing over a given period of time? Most assuredly not. Paradoxical as it may seem, the infection may start as a chronic disease as, for instance, in maxillary empyema of dental origin, where the continued slight infection from the minute fistula in the carious tooth slowly and gradually spreads out into the floor of the antrum until finally the entire cavity is involved. The process from its very inception

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has been essentially of a slow and chronic nature, at least as far as the symptoms were concerned. On the other hand, our usual conception of a chronic stage is the condition of comparative quiet that follows after the acute symptoms have run their course. Now, nobody can fix a time limit on which this occurs. No given length of time can be arbitrarily stated in which an acute disease will become chronic. It depends entirely upon the numerous causes and combinations of causes which have given origin to the disease, together with the favorable or unfavorable anatomic configurations, not to mention the virulence of the attacking microorganisms or the susceptibility of the individual. There exists no sharp line of deviation, either clinically or pathologically, between the acute and chronic stadia. Even in autopsy findings it is difficult to determine whether the diseased sinus has been acutely or chronically affected.

The cause of the chronicity depends upon many factors, which I give in the order of greatest importance:

1. Interference with normal aeration and drainage. This must be divided into natural and acquired.

a. Natural.—In this category belong the anatomic peculiarities, such as a deviated nasal septum, particularly high up, thus causing the nasal passage to be extremely narrow on that side, and wedging the middle turbinate against the bulla and lateral wall of the nose.

b. A long and narrow nasofrontal duct, which would become occluded at the slightest swelling of the lining mucosa, thus closing the frontal sinus like a cork in the neck of a bottle.

c. Deep recesses and partial septa in the sinus cavities, thus predisposing to the retention and stagnation of contained secretions.

d. Large rolled out middle turbinates, hugging close to the lateral nasal wall, thereby occluding the normal drainage passages.

e. In the case of the maxillary sinus, roots of teeth extending into the floor of the antrum.

a. Acquired.—Repeated attacks of choriza, causing a chronic thickening of the mucosa, with gradual interference to drainage and ventilation.

b. Inflammatory changes in the sinus mucosa, causing an inhibition to the movement of the cilia, thus preventing them from ridding the sinus cavity of the invading microorganisms.

c. Type of infecting organism.

No matter what the type of the primary infecting germ may have been, after a certain length of time one of the commoner varieties, either the staphylococcus aureus or the streptococcus, not usually the viridans or hemolyticus, is the predominating organism. In my experience, if the streptococcus is mostly present, the disease runs a rapid course, while conversely, if the staphylococcus is predominant, the course is apt to be slower and much less violent, both in its subjective and objective symptoms.

I recall particularly a young man came into the hospital after a peculiarly severe attack of acute frontal sinusitis from deep diving. He presented himself for diagnostic purposes feeling much improved over his condition of the previous week and rather resented the idea of an operative procedure. But at the time of operation, at least half of the frontal lobe was covered by an extradural abscess. The culture showed a pure strain of staphylococcus aureus.

So much, then, as a preface to the consideration of the actual conditions in the various sinuses.

We propose, with your toleration, to treat only with the chronic affections of the true sinuses, namely, the frontal, maxillary and phenoid or those which are surrounded by hard, unyielding bony walls and situated outside of the general nasal cavities.

The ethmoid capsule is a totally different structure, whose chronic pathology is a chapter unto itself, the consideration of which at this time would be too great an indulgence upon your already overtaxed patience.

The true sinuses, although reacting in a similar manner to chronic infection, nevertheless exhibits quite a different symptomatology, due to their anatomic configuration, differences in drainage mechanism and position. Thus in certain ones the formation of a mucocele is comparatively common, while in others seldom seen. Again, rupture and fistula formation are often noted with, for example, chronic frontal sinusitis and almost never in any of the others.

Let us now consider some of the commoner manifestations of chronic infection in the individual sinuses.

The Frontal Sinus.—The ordinary case of chronic frontal sinusitis usually results from repeated attacks of so-called cold in the head, which may or may not have been traced to an earlier attack of influenza.

The patient states, "Doctor, whenever I take cold my old sinus trouble gets worse." It can very well be compared with a chronic appendix. The patients are really only uncomfortable during the exacerbation of the attacks. The pathologic changes in the mucosa in these cases are slight and, if given half a chance, would quickly heal and probably never more bother the patient. The astute sinuologist, after a preliminary examination, recognizes this and looks for the causative factor of the chronicity, knowing well, if this is removed, regeneration will immediately commence in the inflamed sinus mucosa with an ultimate return to normal. In other words, the deflected septum, cystic middle turbinate, or what not, that was of just sufficient obstruction to carry along a low grade form of chronic inflammation in the sinus, if corrected, removes that factor which prevented a spontaneous cure after the original acute attack following influenza.

Under these circumstances, it is far better to seek out these obstructions to aeration and drainage and remove them than to employ our time trying to lavage the sinus with all sorts of old and new antiseptics, and expect a result that will last much longer than the patient's visits.

Suppose, however, that for reasons beyond our control, we are too late with the intranasal surgery, or that it had already been done when the patient came into our hands, and well done at that, yet for one reason or another the progress of the disease had remained unchecked. It seems to me that this is the type of frontal sinus case that usually comes to us, tired of the periodical suffering and willing to submit to any procedure which in our judgment will give permanent relief. It is these very cases, I am sorry to say, that hitherto have been considered as indicated recipients for some form of the external operation. How many times have I done an external radical on these sufferers which may have brought freedom from their pain, but as I see it now, could have been just as thoroughly

and perhaps quickly relieved by some less extensive resection of bone and cutting of tissue. I freely admit, in my own practice, I have to all intents and purposes eliminated the external method as originally advocated by Killian. I have long since seen the futility of extensive resection of bone in the class of cases just mentioned, and have guided my hand accordingly and, furthermore, have procured just as good, if not better, results than I had hitherto obtained. When the discharge has become foul smelling, the prognosis for a favorable outcome becomes inversely as to the fetidity of the secretion, and greater aeration and possibly the curette become indicated. But even though with the extensive procedures good results follow, I do not in the main, gentlemen, subscribe to the old adage that "the end justified the means," when lesser means would have sufficed to bring about equally as good if not happier results.

When rupture externally, with fistula formation, occurs the entire situation instantly changes. Any intranasal procedure, however extensive, is no longer considered, as it does not offer any possibility of a cure. An external operation of unlimited extent, if necessary, is indicated in order to bring all diseased parts under immediate inspection, but even here it is seldom desirable to resect the great amount of bone as was advocated by Killian.

Fistulas will heal under proper drainage, and sufficient drainage can be installed without completely skeletonizing the entire sinus.

Another variety, or rather an end result of chronic inflammation, is the formation of a mucocele or cholesteatomatous mass. In operating, a mucocele being present, the choice of operation is not with the surgeon, but he must shape his ends according to the size and extent of the cele. Cholesteatoma of the frontal sinus I have never seen, but, judging from the habits of our otologic brethren, a radical operation as extensive as necessary would also here appear to be indicated.

The Maxillary Sinus.—Chronic inflammation of the maxillary sinus presents a wide range and variety of symptoms, and indeed some aspects which are not to be found with any of the other sinuses.

Perhaps the mildest form of chronic infection of the antrum is that one seldom referred to and never described. I mean, pathologically speaking, when the antral mucosa has to a greater or lesser extent undergone polypoid changes but gives rise to no particular subjective symptoms. Needle puncture elicits but a thick, clear straw colored fluid, which intimately mixes with the injected solution and scarcely changes its appearance. As a matter of fact, this condition is seldom diagnosed except by accidental or intentional needle puncture. The significance of this infection is not in itself, but rather in what it may cause or terminate into. An antrum in this condition sooner or later becomes infected with the common microorganisms of suppuration, and then we have a chronic purulent sinusitis which, owing to the long continuing, permanent pathologic changes in the mucous membrane, defies any counteraction of ours to allay the inflammation short of the chisel and curette. Occasionally it is true that after a number of lavages the secretion loses its purulent characteristics and returns to the clear, straw colored consistency, but sooner or later infection becomes so widespread and acute attacks so frequent as to make the patient's existence so miserable that he demands complete and permanent relief. The proposition often arises in these cases, How long shall we continue the needle puncture and lavage before recommending operative procedures? That is a question which will continue as long as we have conservatives and radicals. The first (conservatives) are overly sanguine, the latter unduly impatient. The former will contend that cures have been reported only after fifty or more needlings with lavage. The latter will retort that many cases, through ill advised procrastination, have been obliged to undergo an external radical operation to insure a successful outcome, when a simple intranasal procedure would have sufficed, if done at an earlier stage of the disease.

That brings us to the value of antiseptics to use as irrigating menstra. I must confess to disillusionment and shattered hopes, particularly since the war. Since that period I used the various chlorin solutions with the greatest of anticipations, only in the end to experience disappointment. Then followed acroflavin, mercurochrome and now dibromin. The first two have been thrown in the discard and the last is in a

fair way to follow. I have but three menstra that I now regularly use, normal saline solution, alcohol and nitrate of silver in varying strengths. The latter is but a last resort method before turning to the knife, and occasionally, but only occasionally, does it make good. The character of the secretion, to my mind, is one of the most reliable indications as to the state of the antral mucosa, again pathologically speaking. A thick, heavy mass or masses of yellow pus, which show a tendency to coalesce, indicate that the lining membrane still possesses plenty of working cilia, and, ipso facto, cannot be profoundly diseased, at least in any appreciable area. While on the other hand, a thin, whitish, fetid discharge, which freely mixes with the injected fluid to form a milky, granular mass, shows only too clearly that the cilia are not only non-functionating, but gone, and metamorphosis into the squamous type is already far advanced.

Now while on this subject, a word regarding the danger of the needle puncture. While comparatively little has been written apropos of this, nevertheless, the few articles that have appeared have apparently made a deep impression and attracted widespread attention. To my mind, the danger has been exaggerated beyond all degree of its relative importance. I have never yet seen an instance in which needle puncture was done (properly or improperly) that was even followed by alarming symptoms. This includes numerous cases of air injected into the orbital cavity and the preantral region, and in one case where a quantity of solution was injected into the tissues around the eye. However, in making this puncture and lavage, several technical points are strictly adhered to.

1. The puncture is always done through the inferior meatus.
2. A small quantity of air is always injected under the slightest possible pressure.
3. If resistance is felt, the pressure is removed and a stylet passed through the needle.

It would appear in most of the fatalities that came to autopsy, that portion of the antral mucosa lying around the point of entrance of the needle was detached from the underlying bone, showing that the injection either of air or fluid was directly responsible for the sudden death. If the three postulates just referred to were followed in introducing the needle,

perhaps the occurrence of these fatalities would be greatly mitigated or even entirely overcome.

Another form of chronic maxillary sinusitis is that resulting from a decayed tooth, the infection spreading through the root canal and out the foramen at the extreme tip of the root. The frequency of this, compared to the sinusitis of nasal origin, is comparatively rare, at least in my experience, although it is curious to note the wide divergence of opinion of different observers, the scale running from 5 to 100 per cent. I was inclined to accept about 20 per cent as the proper proportion, but in reviewing the cases that have come under my observation to date, it would seem that even this figure is now too high. This form of the disease, due probably to its insidious chronicity, is very prone to become infected with the ordinary saphrophytic organisms connected with putrefaction and become very fetid. Still another form of chronic antral disease is the formation within the sinus of a solid mass resembling cream cheese. This may be due to the infecting germ for some reason becoming attenuated, and the secretion, being unable to escape, gradually loses its fluid content, the residue forming this cheesy material.

Another, but perhaps less frequent cause, is due to the occlusion of the mouth of one or more mucoid glands, which results in a mucocoele, the contents of which later become solidified. A moderately large opening beneath the inferior turbinate through which in succeeding treatments it was possible to wash out this caseous substance has sufficed for me in the few cases that I have been called upon to treat.

THE SPHENOID SINUS.

Probably less is known about the chronic conditions in cavity than in any of the others, on account of the fact that it has been less under direct observation, for reasons that are obvious to all. I know of no condition more difficult to diagnose than a low grade chronic nonsuppurating sphenoiditis that at best has given rise to but vague symptoms referable to the head. But we are getting too far afield. To return to our subject: Chronic inflammation of the sphenoid mucosa may extend all the way from a low grade almost nonsecreting and symptomless catarrh to a profuse purulent discharge, with

all sorts of pains and aches in near and remote portions of the body.

Included in this low grade form, but in a more advanced stage than that mentioned above, is the hyperplastic type of sphenoiditis. The most prominent symptom of this does not lie in the nose, but outside of it, in the form of vague but intractable occipital headaches, often associated with ocular disturbances and a postnasal discharge, and, on examination with the nasopharyngoscope, usually reveals nothing.

The chronic purulent form is much franker in its manifestations, but as they are so well known to you, I will merely refer to them in passing.

One symptom, however, that I have noted in several cases but have never heard described is a dull pain in the supra-orbital region of the affected side. On opening the sinus this invariably disappeared.

With this, gentlemen, I will close. While I appreciate that this dissertation has been sketchy and rambling, nevertheless, it seemed to me to be more suitable for a gathering of this sort than the usual textbook presentations that ordinarily hold sway. If I am correct in this assumption, my time has been well spent; if not, I trust you will take the will for the deed and bear with me accordingly.

THE MEDICAL AND SURGICAL TREATMENT OF
LARYNGEAL TUBERCULOSIS, INCLUDING A
PRELIMINARY REPORT ON THE DIRECT
XXXI.

INJECTION OF TUBERCULIN INTO
THE LARYNX.*

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So important is the disease of tuberculosis, as far as treatment is concerned, that it is difficult to conceive of any other's assuming more importance. Levy¹ says, "No subject in medicine possesses a more extensive or interesting history than tuberculosis, nor can any disease boast of more attempts at solving the problem of its treatment with less permanent, definite and satisfactory results."

To suggest another method of treatment does not bring added security, but only gives added responsibility to the laryngologist who presents it. I am fully aware of the criticism which many very able internists freely offer regarding the general administration of tuberculin, but ophthalmologists have secured some brilliant results from its use in the treatment of tuberculosis of the retinal vessels, and from their success I take courage. Dr. Edward Jackson^{2 3} of Denver was one of the first to recognize the true etiology of retinal hemorrhages in young adults and to recommend the use of tuberculin. Observation of the results obtained in cases of retinal tuberculosis led me to try the direct injection into the larynx. This was not undertaken with the expectation that it will or should displace other well recognized methods of treatment, but with the hope that it will offer a valuable therapeutic agent and result in the saving of more human lives. I believe it has helped the patients for whom I have used it.

*Presented before the American Laryngological Association, Swampscott, Massachusetts, June 2, 3 and 4, 1924.

The first paper on laryngeal tuberculosis appeared in 1790; it was written by Petit.⁴ The next was presented in 1802 by Sauvee.⁵ Since then nearly sixteen hundred articles have appeared in the literature, but most of these during the past fifty years. So far as I know, no one has used, or even suggested, the injection of tuberculin into the larynx for the treatment of laryngeal tuberculosis.

In the West our big problems are first, the early diagnosis of tuberculosis, and second, the best treatment for the individual patient. Nearly everything has been recommended and used for the treatment of laryngeal tuberculosis, and this shows that no single method of treatment is specific. From all those suggested to date it is comparatively an easy matter to select a few of the standard and thoroughly tried methods for the treatment of any given case. To take the extreme attitude that any and all treatment is useless in every instance is not best for the patient. The other extreme of overtreating the larynx is not much better. Inasmuch as no one method of treatment can be used for all cases, it is necessary to consider and test several methods for any given case. I have selected for consideration sixteen methods, eight each of medical and of surgical treatment.

The following, in the order named, have for a long time been well established methods of medical treatment and may be considered as standard:

1. Vocal Rest for the Larynx.—It is just as important as bed rest for the pulmonary lesion. This is true even in case the tuberculous patient has a nontuberculous laryngitis. Arrest or cure of a tuberculous larynx is very difficult or impossible without vocal rest. Sir St. Clair Thomson⁶ gives great credit to vocal rest in the cure of his own larynx, according to his remarks at the American Laryngological Association meeting of 1919. Some laryngologists permit their patients to whisper; others give them pencils and scratch pads. Personally I prefer whispering to a scratch pad, and there is less fatigue from its use. I have always felt that tuberculous patients have to make enough sacrifice to regain their health without using a scratch pad. I, therefore, recommend this only in extreme cases. Lublinski⁷ favors silence as a very important therapeutic measure.

2. Dilute Aqueous Solutions of Lactic Acid.—They are to be used in gradually increasing strengths of from 5 to 30 per cent and occupy no less an important place in the laryngologist's armamentarium than does the cautery. This method is often spoken of as Lake's⁸ treatment, and the acid is conveyed by a cotton wound applicator to the larynx. Lactic acid is particularly useful for the treatment of superficial ulcers; it also acts as a valuable antiseptic and astringent.

3. Formalin.—Its use in 5 per cent aqueous solution has been advocated. It has some value in the treatment of superficial ulcers, but is probably not so reliable as lactic acid. We have used formalin only occasionally for several years. In former years I used it almost routinely. Lockard,^{9 10} however, obtains excellent results from its application. This also is usually administered on a cotton wound applicator.

4. Chaulmoogra Oil.—During the past few years chaulmoogra oil has taken a place among the milder remedies. We have used it in twenty-five cases and kept careful notes of our results. My partner, Dr. C. L. LaRue, will publish his observations in the transactions of the American Laryngological, Rhinological and Otological Society for 1924. Some advanced cases have not been benefited by it at all, while the milder ones have nearly all shown very gratifying improvement. It is not a fault of the kind of treatment if advanced types are not helped, because by any method so little can be done for advanced laryngeal tuberculosis. Kolmer, Davis and Jager,¹¹ Lukens,¹² Allaway and Lebensohn¹³ all favor the use of chaulmoogra oil. This is dropped into the larynx from a laryngeal syringe.

5. Climatic Treatment.—This has, for many years, occupied a very important place in the treatment of tuberculosis by internists and laryngologists alike. Edson¹⁴ has recently emphasized the importance of this form of treatment for the larynx. It certainly should be used in every case if at all possible. However, to send away from home patients with very limited means often results in poorer living conditions and poorer medical attention than they could have had at home, with the effect that they are worse for having made the change, except for the benefit to be derived from climate.

6. Heliotherapy.—This method, which is just now popular

in the treatment of joint tuberculosis, has probably never been used so much as it should be, even in the West. While we possess all the equipment for the sunlight treatment of the larynx we rarely use it. Stafford¹⁵ has a recent article upon this subject. Sargo,¹⁶ Jessen,¹⁷ Kunwald,¹⁸ Collet,¹⁹ Baer,²⁰ Hohbaum,²¹ Koch,²² Tillman,²³ Kramer,²⁴ Kraus,²⁵ Janssen,²⁶ and many others have all advocated and used sunlight for the treatment of laryngeal tuberculosis. Heliotherapy is accomplished by means of the solar laryngoscope.

7. The Quartz Lamp, Finsen Light, etc.—These all have a rather limited field of usefulness. Our hospital is equipped with a quartz lamp, but we have not had any experience with its use for the treatment of laryngeal tuberculosis.

8. Radium and X-Rays.—We have used the latter, though not the former, and with good results in early cases. Freudenthal²⁷ used radium for laryngeal tuberculosis as long ago as 1905. X-ray treatment has been used by Ramdohr²⁸ and others.

The surgical treatment of laryngeal tuberculosis is as follows:

1. The galvanocautery, while it cannot be used in all cases, offers, in all probability, the best single method to date for destruction of the tubercles. Jackson,²⁹ Levy,³⁰ Grünwald,³¹ Dean,³² Thomson,³³ Arrowsmith,³⁴ and many others have for years used the cautery. Jackson's²⁹ book contains the following:

"Galvanopuncture for laryngeal tuberculosis has yielded excellent results in reducing the large pyriform edematous swellings of the aryepiglottic folds when ulceration has not yet developed. Deep punctures at nearly a white heat, made perpendicular to the surface, are best. Care must be exercised not to injure the cricoarytenoid joint. Fungating ulcerations may in some cases be caused to cicatrize by superficial cauterization. Excessive reactions sometimes follow, so that a light application should be made at the first treatment."

Dean³² favors cauterization of the larynx by suspension, if the patient's pulmonary lesion will permit. He says that the first essential thing in treating laryngeal tuberculosis by suspension laryngoscopy is to have the patient under the supervision of a pulmonary expert, who has authority to say this

patient shall or shall not be suspended. Only by such a procedure can serious results be prevented. Dr. Dean never advises treatment by suspension; he does recommend it if the pulmonary expert thinks best. The patient must be examined and approved of by the pulmonary expert each time he is suspended. He must be watched carefully after each suspension. At times, so far as the laryngeal picture is concerned, six or eight cases should be suspended the next day, but only one or two appear for the work; the pulmonary expert has not approved of the work's being done at this time. Later, when conditions are favorable, the patient is sent for the endolaryngeal work under suspension.

Arrowsmith³⁴ says, "In superficial ulcerations the galvanocautery accurately used, as is possible only under direct exposure, leaves nothing to be desired. I cannot imagine how anyone after a single experience would ever revert to chemical caustics."

2. Curettage has rather a limited field of usefulness, except perhaps for superficial ulcers. It may be used for cleaning and stimulating ulcers. This method of treatment is probably employed less today than formerly, except in conjunction with the cautery.

3. Excision of tuberculomata has a very useful place in the surgical treatment of laryngeal tuberculosis, especially when the mass is interfering with respiration. Masses which project into the lumen of the larynx can often be dealt with to better advantage by excision than by the use of the cautery. The operation can usually be done promptly, and there is less subsequent reaction in the larynx. The bleeding base should be cauterized to avoid postoperative hemorrhage and infection. Arrowsmith³⁴ believes, "Slight or moderately extensive lesions can surely be cured by well considered surgical treatment with the aid of suspension exposure; the severer ones can be much ameliorated and the consumptive helped, at least, to die without the intolerable suffering which so often accompanies tuberculosis of the larynx."

4. The injection of alcohol for the relief of pain has very little curative value, as this serves usually in the later stages as a purely palliative measure. It has been advocated by Hoffman,³⁵ Sturmann,³⁶ Grant,³⁷ Fetterolf³⁸ and many others

since Hoffman³⁹ first suggested this in 1908. Vanderhoof⁴⁰ offers the following technic:

"This operation can be done either in the office or at the bedside of the patient, but in either case antisepsis should be practiced as in any operation."

"The syringe and needle should be wrapped in sterile gauze and boiled. The alcohol (of which we use a 50 per cent solution) is placed in a sterile medicine graduate. Exactly 3 c. c. of this solution is prepared for each nerve, although we have never found it necessary to use over 2 c. c. for the injection of any one side. If it should be advisable to inject over 2 c. c. at any one time, the syringe can be easily removed from the needle and more of the solution drawn up into the barrel of the syringe. Then the syringe can be reattached to the needle and as much more of the solution can be injected as is desired."

"The patient should be in a recumbent position with the head slightly thrown back, thus putting the muscles of the neck on a stretch. He should be told that the necessary work will cause him very little pain and the discomfort will last for only a very short time. In this way you can in most cases gain the confidence of your patient, which will help greatly in the work you wish to do."

"The nerve which you wish to locate is situated just above the upper edge of the thyroid cartilage and about one-third the distance from its outer edge. As to exact measurements, I have usually found the nerve just 3 cm. from the incisura thyroideæ."

"If you will press at this place with your finger nail, and you are directly over the nerve, there will be a sensation of pain. This I have found to be true in most cases, but it is not to be absolutely relied upon. The skin should be sterilized with iodine, and as soon as you have to the best of your ability located the region of the nerve, the skin is picked up between the thumb and forefinger and the needle inserted with a slow pushing and twisting movement. On account of the dullness of the needle this is the most painful part of the whole operation as a usual thing. After the needle has passed through the skin, I then insert it according to Horn's method: that is, slowly push the needle $1\frac{1}{2}$ cm. perpendicularly to the skin and move the point slowly around in all directions till the pa-

tient complains of a sharp pain in the ear. Sometimes instead of complaining of a pain in the ear he locates it as being in the jaw, and one patient said there was at the same time as the pain was felt in the ear also a sharp pain in the arm on that side. In some cases there will be no sensation of pain in any special location, so it will be necessary to inject your solution, hoping that you are in proximity to the nerve.

"The solution should be injected slowly, about five minutes being used in injecting the whole amount, and while injecting it the point of the needle should be moved about a little in all directions. On withdrawal of the needle it will be found that there is usually hardly a drop of blood at the location of the puncture, due to the fact of using a dull pointed needle. A little flexible collodion placed over the puncture completes the operation."

Fetterolf³⁸ concludes that study of the reported cases would indicate that this method has a distinct place in the treatment of inoperable cases of advanced tuberculous involvement of the larynx, and that in it we have a procedure which requires no special apparatus or training, which is not hazardous or dangerous, which is not seriously painful, which can be repeated as often as may be required, which is usually successful at either the first or second attempt, and which can produce few untoward effects and those but temporary.

5. Tracheotomy in rare instances with advanced laryngeal manifestations has a place, but usually a less important one than in cases of malignancy. In 1879, Beverly Robinson⁴¹ recommended tracheotomy chiefly for the purpose of putting the larynx at rest. More recently Blumenthal⁴² has advocated tracheotomy.

6. Laryngectomy, or even laryngotomy, may be resorted to if malignant disease is combined with tuberculosis. While we can all picture a laryngeal lesion demanding radical major surgery, such cases are rare, especially when the laryngeal lesion is not the only tuberculous lesion with which we have to deal. The pulmonary disease often demands first consideration. Arnoldson⁴³ believes major surgery should be considered only in case all the diseased area can be removed. This is quite possible in the early stages, but with only slight in-

involvement less radical measures are indicated. Hansberg⁴⁴ favors laryngotomy.

7. Amputation of the epiglottis has yielded excellent results in the hands of Lockard^{45 46} and others. This method of dealing with extensive involvement of the epiglottis is probably not soon to be replaced by any other surgical procedure. This may be done by suspension laryngoscopy, as advocated by Dean,³² with Lake's forceps by the indirect method or with a cautery snare. Personally, I have usually used Lake's forceps, because most of the patients for whom I have performed this operation have come to me with well advanced laryngeal and pulmonary tuberculosis, so that I had very little choice of method. The relief of pain and the greater ease with which patients swallow, following amputation, is most gratifying.

8. During the past few years Lowen,⁴⁷ Cooper⁴⁸ and others have advocated and used gastrostomy. Cooper⁴⁸ advocates the operation to allay the intense suffering in the late stages of the disease. He has the following to say:

"Our efforts to allay these distressing symptoms by relying on local anesthetics, analgesics and the internal administration of narcotics have too often proven futile, and we have frequently watched our patient make the exit from life with great suffering and distress. Of our sympathy they have plenty; of effectual help, but very little; of cure, none. We recognize that the time has come for this one or that, when the physician must step aside, unable to prevent the one thing of life which is inevitable; even though such an event is in all probability our most interesting experience. Any procedure, therefore, that might lessen the pain of these unfortunates, prolong their life free from suffering or make their exit in comparative comfort is worthy of consideration.

"It must be remembered that extensive ulceration usually, but not always, occurs in the late stages of pulmonary tuberculosis. Occasionally we find it associated with mild, well localized pulmonary lesions. It is in these latter that most can be expected from gastrostomy.

"Cases should therefore be selected, first as to the cure of the laryngeal lesions; and second, as to their relief. In the latter the patient should be informed of what to expect.

"Death from starvation and thirst must be a terrifying experience, and in the absence of other effectual measures to relieve it gastrostomy should be performed, even though no reason other than relief of the starvation and thirst exists. The same justification holds for this as for tracheotomy in laryngeal carcinoma to prevent death from suffocation.

"Benefits: These may be summarized as,

"(a) Rest to the larynx. It is needless to detail the advantages of rest.

"(b) Better nutrition, which is evident. Tube feeding is certainly more effective than per oram over an ulcer, when the patient cannot swallow or refuses to on account of the pain.

"(c) Relief of pain.

"(d) Promotion of healing, which theoretically is tenable because of the rest and absence of food irritation and which has actually occurred in two of the cases.

"(e) Diminution of the toxemia.

"Objections:

"1. Surgical Risk.—If gastrostomy is to be done at all, one should not wait until starvation has made a derelict out of the patient. It should be done earlier than that, and, from the few cases here reported, the patients have stood the operation quite well. General anesthesia should of course be avoided.

"2. Gastric Tube Feeding.—The patient can probably answer this better than the physician. I believe that the patient would insist that the annoyance of tube feeding is far less than the difficulty and pain of per oram feeding. The contraction of the stomach, which occurred in cases 4 and 5, though a perplexing and annoying complication, one requiring much patience and attention, should not be considered of sufficient importance to prohibit a gastrostomy and its benefits.

"Do the results justify the procedure? From the few cases presented they do. In addition to the relief of the distressing symptoms there is lessening of the toxemia, probably due to increased nutrition; healing of the local lesions and general pain in laryngeal tuberculosis.

"It should be noted that after gastrostomy, local remedies—e. g., galvanocautery, stimulation of indolent ulcerations, removal of greatly diseased tissue, thus promoting regeneration,

soothing applications to acutely active lesions, etc., should not be abandoned.

"The literature on this subject is very meager. Lowen mentions that he found none, and Freed had a similar experience. It is probably not a new procedure, but certainly has not received much consideration by laryngologists or surgeons. A good deal has been written about gastrostomy for relief of esophageal obstruction, but we have little pertaining to its use for relief of pain in laryngeal tuberculosis."

To these standard methods of treating laryngeal tuberculosis we add now the direct injection of tuberculin into the larynx. We have used this treatment in too few cases (less than ten) for anything more than a preliminary report, but that we hereby offer. We are using it cautiously by beginning with 1/10 of a milligram of O. T. and gradually increasing the dose if the preceding one has been well tolerated. An interval of two to six weeks between injections is an additional safeguard. The injection is made at the point of greatest swelling after cocainizing the larynx. The point of the needle should penetrate deeply enough to reach the center of the tubercle if possible. A submucous injection is less desirable.

Small doses and in small volumes are best. We try to inject not more than $\frac{1}{2}$ to 1 c. c., in order to avoid the edema at the point of injection. A large dose is apt to produce a severe reaction in the larynx, with more or less severe general reaction. Prime reasons for making the injection directly into the larynx are, first, to place it where it is needed most, and second, to avoid the general reaction.

The objection may easily be offered that the effect on the larynx will not be materially different from what it would be if it were injected subcutaneously. However, this is not a just criticism. If the laryngeal injection can be made directly into the center of a tubercle the maximum therapeutic effect will occur at the point of injection. The absorption from the caseated center should be slow, with the maximum local therapeutic effect, and with a minimum general effect. Since it is the local action we want in the larynx and not the general, this method of treatment in selected cases is of value.

If it were desirable in any given case to build up the patient's general resistance to tuberculosis first, the subcutaneous

injection of tuberculin would be the method of choice, provided tuberculin is to be used at all. However, we see patients occasionally who are making good progress so far as their general health and pulmonary tuberculosis are concerned, and have only a slight involvement of the larynx, but the laryngeal disease is advancing slowly. In such cases injection of tuberculin into the tuberculous area of the larynx certainly seems to have a beneficial effect.

By making the injection in the larynx, instead of subcutaneously, the site for the local reaction can be selected in the larynx, with the advantage of combining the local reaction with a mild focal. It is the local reaction which seems to produce the improvement by local immunization and local stimulation. It is, of course, impossible to tell how much of the reaction is focal and how much is local. I have tried to avoid anything more than a mild focal reaction by using small doses.

Conclusions.—Thus far my limited experience leads me to believe that injection of tuberculin should not be used if either the pulmonary or laryngeal disease is advanced. Patients with fever above 100 are not suitable subjects for injection. If there is very much edema any injection, even with a very small quantity of fluid, is contraindicated, because an increase in the swelling may produce necrosis. Small localized areas, especially if unilateral, are best. It is the stimulation from the local and focal reaction combined which is desirable. Even under favorable circumstances it is doubtful if more than 10 per cent of all cases will be benefited. However, more experience may alter the preceding opinions. This method of treatment is too new for me to say that it will help even half the patients suffering with laryngeal tuberculosis. I know it has helped the few for whom I have used it.

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XXXII.

THE LITERATURE OF THE AMERICAN LARYNGO-
LOGICAL, RHINOLOGICAL AND OTO-
LOGICAL SOCIETY.*

BY HANAU W. LOEB, M. D.,

ST. LOUIS.

The presidents' addresses in the thirty years of the association's activity have covered a wide range of subjects. They have been mainly of a general character, though some were concerned with education, progress and exhortation. They have been full of the spirit of the society and of American otolaryngology.

In seeking a subject for my own address, I had hoped to provide matter of value from a practical as well as from an historical standpoint. At the same time I had determined that I would, in slight measure, show the deep love I have for the association and the heartfelt appreciation of the distinguished honor conferred upon me, the greatest in American Otolaryngology, by making me your presiding officer for the thirtieth annual congress.

In pursuance of this endeavor, the conviction has come to me that it would be well for us, after thirty years of activity, to take stock, as it were; to discover if we have fulfilled the hopes of the founders; if we have kept pace with the progress of otolaryngology, and if we have achieved distinction among the otolaryngologic associations of the world.

We can all give testimony to the value of the society in effecting and cementing lifelong friendships among the Fellows, in teaching us, year by year, to profit from each other's experiences, and in working for the common good of our specialty. But what have we done for otolaryngology? What

*President's Address, delivered at the Thirtieth Annual Meeting in St. Louis on May 29, 1924.

have we done to advance its position in medicine? And what of lasting or even temporary value have we added to its scientific development?

These are the questions which I shall endeavor to answer by presenting a study of the literature of the society. Unrecorded science is of no interest to history, humanity or to science itself—the record alone can establish its value to the common good. And thus I point to our literature as the best evidence of what we have done—we stand or fall by the verdict.

In the past twelve months I have reviewed every paper published in the transactions of the society, not as a disinterested editor or critic, but as one before whom pass in review the men who have written the papers and who, as it were, a second time submit their contributions for judgment.

I hear again the papers which I heard in the enthusiasm of my youth, now with a more mature understanding. Yet the earlier reaction clearly dominates. I see again the writers of those papers, some who have crossed to the other shore but many who, though changed, still abide with us.

If I say I have enjoyed this renewal of my experience with the literature of the society, I would be stating it too mildly, for it has been a most thrilling retrospect, a revival of so many of my experiences of earlier days and a requickening of old friendships long since stilled by the hand of time.

The discussion of the theme is too extensive to permit me to read it in its entirety. I have therefore arranged it in two sections:

I. A subject division which is planned to show the important divisions made by the society to the literature of medicine, according to the subjects stated.

II. A personal division, which deals with the Fellows themselves in relation to the Transactions.

Approximately 1,300 papers have been read by Fellows and guests of the society at its meetings and those of its sections, in addition to numerous presentations of instruments, etc. It is to be regretted that it is not possible in the allotted time to mention everyone whose contribution has been of scientific or literary interest. As it is, only the more prominent contributors or those who have presented papers of outstanding merit can be considered.

SECTION I. SUBJECT DIVISION.

Anatomy.—Anatomy very naturally falls within the scope of otolaryngology in view of its essential importance in the daily work of those who qualify as experts. Morphologic investigations have been fairly extensive, particularly in the gross anatomy of the paranasal cavities and organs concerned in endoscopy. Ingersoll is responsible for most interesting studies in the comparative anatomy of the paranasal cavities of mammals and Loeb for studies in the paranasal cavities of man, particularly with relation to the optic nerve. Pierce, Keiper and Mosher have studied the tonsil in this regard, and Bigelow, Downey and Oppenheimer the mastoid process. Mosher's most extensive researches, in addition to those upon the tonsil, have been directed to the premaxillary wings and deviations of the septum, to the anatomy of the esophagus and particularly to the cardiac portion and its relation to the liver.

Physiology.—While on the part of the Fellows there has been very little investigation in general physiology, much has been done bearing upon the physiology of the factors involved in otology. As to the study of the cochlea and the hearing function, we find most interesting investigations by Bane, Bryant, Fowler, Wales and Wells. The investigations of the function of the vestibule have been directed towards the Barany tests, in fact, much of our understanding of the vestibular relation to aviation has resulted from the work of Jones, Fisher, Hastings, Dennis, Kerrison, Lyman, Lewis and Walker. McKenzie has been more interested in galvanic nystagmus. Audiometry has been greatly stimulated by the work of Fowler and Dean. Fowler's work on drum tension and Makuen's on the physiology and psychology of hearing have been important additions to our literature. Anderson has studied nasal obstruction, Ingersoll the function of the paranasal cavities, Mullin the lymph drainage of the paranasal sinuses, Wood the tonsils and Fetterolf reflex cardiac inhibition resulting from irritation of the peripheral fibers of the trifacial nerve.

Pathology.—Beck has been the most extensive student of pathology, contributing papers on almost the entire field. Papers on the pathology of the tonsil have been presented by Wood, Myles and Babbitt. Wood is recognized throughout

this country as an authority on pathology of the tonsil. Babbitt and Baum have contributed papers on benign growths of the nose and Skillern on bone cysts of the middle turbinate. Kopetsky's investigation on meningitis resulted in awarding to him the gold medal of the society. Very interesting contributions were made by Cox on status lymphaticus, experimental studies of the effect of atmospheric conditions on the upper respiratory tract and upon the effects of mustard gas poison on the upper respiratory tract, and by Jarvis on the upper respiratory tract in granite dust inhalation. Braden Kyle was responsible for two papers on the pathology of malignant growths of the upper air passages and general pathologic processes associated with or following infection of the accessory sinuses. Papers that justify mention in this connection are those by Freudenthal on the pathogenesis of bronchial asthma, Richardson on pathology of adenoid growths, with particular emphasis on Jackson's paper on the larynx in typhoid fever.

Bacteriology.—Perhaps the most extensive bacteriologic studies were made by Dwyer on the methods of modern bacteriology and studies in immunity, by Horn on the bacteriology of ozena, by Cox on the isolation, cultivation of tubercle bacillus from the discharging ear and by Dean on the bacteriology of paranasal sinus disease in children. Friedberg is represented by papers on the removal of tonsils and adenoids in diphtheria carriers. Vaccine therapy has been extensively studied by Bane, Beck, Cobb, Levy, McKernon and Weil. Mention must be made of the work of Dench and Phillips on the bacteriology of suppurative otitis media.

Diagnosis.—Diagnostics is a factor in most of the papers that have been presented before this society. However, it has been made the special feature in a number of most valuable contributions. The diagnosis of mastoid disease and its associated conditions and the indications for operation have been established in American otology by the papers that have been presented before this association, while those on paranasal sinus disease have been no less equally important. For the former Dench, McKernon, Phillips, Day, Canfield, G. L. Richards, Harris, Allport, Reik, Beck, Kerrison, McCuen Smith, Shambaugh and Stucky and many others have been

responsible. For the latter Coakley, Barnhill, Loeb, Coffin, Curtis, Freudenthal, Haskin, Christian Holmes, Mosher, Myles and Pierce have been most productive.

Metagnosis.—The Fellows of the society have always been concerned in the end results of operative work and treatment of all kinds; as a consequence, metagnosis has been a common topic. One of the first papers on the subject was by Levy upon serious consequences following intranasal operations, read at the fourth meeting of the association. Stucky and Roy have presented papers bearing on the results of tonsillectomy. Richardson's paper presented seven years ago on abscess of the lung following tonsil operation called for great concern on the part of the Fellows for whom this was a new complication to be considered. Frank's paper on post-operative acidosis in children had a similar effect. Loeb's papers were more general in their type detailing the fatalities occurring after nose and throat operations, analyzing 444 cases which were hitherto unreported. Cobb and Richardson have discussed end results of submucous resection and Sauer those following operations for chronic sinus disease. The end results of mastoid operations have been the subject of numerous papers, more particularly by McKernon, Dench, Phillips and MacCuen Smith. Shepherd and MacCuen Smith have considered the whole question of chronic otitis media in this regard. Many cases are reported showing unanticipated or undiscovered conditions, some of which might have been determined by more modern methods or by more searching investigation at the time. The manifest trend of clinical investigation in this line is most hopeful.

Clinical Observation.—Very naturally from a body composed of scientific physicians a large number of papers on clinical observation must originate. In this particular, this society follows such a general rule. As various laboratory methods were introduced into general medicine, through the agency of this association they were made available for use in otology. In this connection work has been done on the differential blood count in its relation to suppurative otitis media and its complications, spinal puncture, bacteriologic examination of ear discharges and roentgenographic diagnostics. Some of the more conspicuous developments from the clinical obser-

ventions of Fellows in this society may be mentioned as follows: Dean on paranasal sinus disease in children, Day and Jackson on the ear and throat complications of typhoid fever, Myles on paranasal sinus disease, E. M. Holmes on conditions affecting the eustachian tube, Mosher on esophageal conditions, Beck on general laboratory methods, Bryant on tinnitus aurium, Coakley on radiography and clinical studies of the paranasal sinuses, Emerson on chronic otitis media, Goldstein on deafness, Makuen on speech defects, Shambaugh on the labyrinth, Sluder, Beck and Richards and others on the tonsil, McKernon, Dench and many others on mastoid disease and its complications.

Non-Surgical Therapeutics.—Though otolaryngology is essentially surgical, Fellows of the association have found other means of relieving certain manifestations of disease within its field. Among the more important presentations from this standpoint may be mentioned salvarsan and the auditory nerve by Beck and by Davis, the treatment of acute laryngitis of singers by Curtis and chronic laryngitis by Ingals, intratracheal injections by Thompson, the nonsurgical treatment of sinus disease in children by Dean, electric light in diseases of the respiratory organs by Freudenthal, tinnitus aurium by Harris and Bryant and the non-surgical abortive treatment of acute mastoiditis by McKernon and Bane.

Surgery.—In the thirty years of the society's existence otolaryngology has been almost entirely changed in its ideals and practical application. It has become a surgical specialty; in fact, the growing influence of surgery in otolaryngology cannot be observed to better advantage than by studying the papers of the association. In the earlier days, this specialty was just becoming emancipated from the nineteenth century influence of sprays and washes, topical applications and cauterization, and was beginning to assume a position which required attention to the details of aseptic surgery and surgical technic. When Myles presented his paper on the nasal accessory sinuses, at the second meeting, which was the continuation of a paper he had read the year before, it excited a great deal of attention, and his position in the treatment of these cases was considered extremely radical. Since that time the surgery of the sinuses has taken on a new radicalism and has settled

down to a more rational basis. So, too, with the first paper of Dench on mastoid and intracranial complications of middle ear suppuration. It was many years before submucous resection became a common operation, and tonsillectomy, as such, according to its present understanding, did not become a prominent factor until a little more than ten years ago. Any review of the surgical procedure in otolaryngology must take into account the work done and reported by Fellows of this association in the following particulars:

Paranasal Sinus.—Beck, Behrens, Canfield, Coakley, Cobb, Coffin, Curtis, Dean, Freudenthal, E. M. Holmes, Ingals, Lynch, Myles, Richards and Yankauer.

Nasal Cavities.—Ballenger, Barnhill, Beck and Myles.

Cranial Nerves.—Barnhill, Beck, E. M. Holmes and Richards.

Intracranial Complications.—Behrens, Crockett, Day, Dench, Eagleton, Kopetsky and McKernon.

Lacrimal Sac.—Chamberlain and Yankauer.

Mastoid Process.—Day, Dench, Eagleton, Kerrison, McKernon, Phillips and Pierce.

Larynx.—Iglauer and Jackson.

Esophagus.—Jackson and Mosher.

Tonsils.—Sluder, Large, McKinney, Myles, G. L. Richards, Richardson, Rosenheim and Wishart.

Labyrinth.—J. D. Richards.

Ocular Relations.—At the second meeting of the society Pooley called attention to the value of the ophthalmoscope in the diagnosis of cerebral diseases in middle ear suppuration. At the seventh meeting Halsted reported a case in which sudden blindness was relieved by operation on the maxillary, ethmoid and sphenoid sinuses. At the same meeting Hoople presented a paper on a nasal condition affecting the ocular muscles. These were the forerunners of many papers based on the ocular manifestations of diseases of the paranasal sinuses and other nose and throat organs. Coffin discussed the ocular circulation as affected by diseases of the paranasal sinuses. Christian Holmes presented a masterly paper, which covered the field of the relation of the eye and orbit to the paranasal sinuses. Loeb presented the anatomic relation and reported two cases of blindness relieved by ethmoid exentera-

tion, and a case of keratoiritis due to tonsil infection. Roy reported a case of paralysis of the external rectus in the right eye following mastoiditis in the left ear. Harmon Smith reported a case of optic neuritis benefited by operation on the sphenoid sinus and ethmoid cells. Tunis presented a paper on sphenoid sinusitis in relation to optic neuritis, and Leon White presented three most instructive papers on retrobulbar neuritis, loss of vision from accessory sinus disease, and anatomy and X-ray studies of the optic canal in optic nerve involvement. Vail, Wilson, Gallaher, Hasting, Murphy and Patterson read papers on similar relations, and Chamberlain and Yankauer on intranasal operation of the lacrimal apparatus. Haskin discussed ocular manifestations in nasal and aural disease indicating involvement of the sympathetic nervous system. This whole chapter is one of the most interesting phases of the utility of the association in bringing out a better understanding of the ocular conditions dependent upon diseases of the nose and throat.

Borderland Surgery.—The surgery of organs adjacent to the nose, throat and ear has occupied the interest of many of the Fellows, as evidenced by numerous authoritative papers which have been presented.

Oral surgery is represented by papers on cleft palate by Barnhill, Carmody, MacKenty, Makuen and J. A. White; on the salivary apparatus, by Beck, Carmody and Myles; dentigerous cysts, by Cobb, Gallaher and Haskin, and actinomycosis of the tongue by New. Haskin's studies of cryptogenic infection of dental origin is worthy of special notice.

The thyroid has been made the subject of study by Barnhill, Cott and Forbes, while MacKenty has made a plea for the inclusion of neck surgery in laryngology. Carmody and Beck have chosen malignant disease of the head and neck for topics.

Plastic surgery for the correction of deformities of the external nose has been made the subject of considerable investigation with much practical result by Beck, Behrens, Carter, Cohen, Frank and Roe. Carmody has discussed plastic surgery of the head and neck, and Goldstein the treatment of perforation of the nasal septum.

Endoscopy.—One might well paraphrase Osler's famous expression by saying that if all endoscopy that had been done

outside of this society was suddenly effaced, much of value would be lost but the world could well go on with what this society had done. It is very hard indeed to speak of the accomplishments of the Fellows in this department without appearing to be vainglorious, but if ever boasting was in order, certainly the work of Jackson, Mosher, Lynah, Ingals and a host of others would justify it. Jackson, in the fourteen papers on this subject which he has presented, has gone through the whole field, including the exhibition of instruments which he has devised, technic, removal of foreign bodies, pathologic conditions of the trachea, bronchus, lungs, esophagus and stomach. His papers constitute a textbook of rare value. Mosher's studies have been in the main directed towards the establishment of a proper relation between endoscopy and pathology, while Lynah, by his masterly work on tracheobronchial diphtheria, has established a new field for the alleviation of human suffering. Other men have contributed largely, for instance, Yankauer, Ingals, McKinney, Iglauer and many who might be mentioned. Thorner brought autoscopy to the attention of the association, and Taylor presented at the last meeting a most extensive study on the sandspur in its relation to endoscopy.

Freudenthal, Lynch and Levy have been responsible for the interest in suspension laryngoscopy. In fact, the work of Lynch is recognized all over the world as that of the leading exponent of this type of endoscopy.

Radiology.—Soon after the photographic properties of the X-ray became known, Fellows of the association endeavored to utilize this property for sinus diagnosis and later for the diagnosis of mastoid abscess. Coakley was probably the first to present skiagraphs of the paranasal sinuses which solved the question. Later, by invitation, Caldwell, who has done so much original work in this particular, presented his method and findings to the association. In addition, sinus radiography was made the subject of two papers by Skillern. Radiographic studies of the mastoid process were presented by Bigelow, Iglauer and Spencer; the larynx and trachea by Iglauer; the trachea, bronchus and esophagus, in connection with endoscopy, by Jackson and Curtis, and otosclerosis by Beck.

X-ray therapy was used as a subject by Beck, Forbes, Hurd, Jarvis, Stein and Borden, and radium therapy by Beck, Freudenthal and Culbert. All of this work has been given the stamp of recognition and is a matter of much just pride on the part of the association.

Speech and Hearing Defects.—Makuen's work in speech defects is well known. It was constructive, almost developmental; at any rate, it was of the highest practical importance to the Fellows of the association. Goldstein's interest, directed mainly to the teaching of the deaf child, has been largely instrumental in developing the work in this country. Richardson was the head of reeducation and reconstruction of defects in hearing and speech in the U. S. Army during the war, and his reports will stand for many years as the last word in this work. Blake presented an interesting analysis of aids for the deaf and discussed war deafness at length, while Curtis discussed singers' nodules and Grayson the chorus girl's vocal troubles.

Tuberculosis.—During the thirty years of the association's existence tuberculosis has undergone a great change. To this change the Fellows of the society have contributed a great part. Among those who may be mentioned are Levy, Bane, Carmody, Donnellan, Freudenthal, Solenberger and Spencer. Tuberculosis of the pharynx, of the ear and of the mouth have been the subject of much study on the part of the Fellows. Woods' work on tuberculosis of the tonsil has a permanent place in the literature on this subject. Other papers on the tonsil and adenoids in connection with tuberculosis were presented by Halsted, Means, Mullin, Wilson and Winslow.

Cancer.—Every phase of cancer and its location in connection with otolaryngology has been studied by the Fellows. Out of the great number of important contributions, it is well to mention Jackson, MacKenty and Freudenthal for their work in connection with cancer of the larynx; Beck for his general studies on all types of cancer with various types of treatment, and New for his work on malignant tumors of the maxillary sinus.

Unusual Cases.—The presentation of unusual cases has been a favorite method for clinical reports and literature studies, from which the following are selected for notice: Teratoma

of the ear and teratoma of the tonsil, by Braslin; teratoma of the nasopharynx, by Coffin; congenital fistula of the external nose, by Pierce; epileptiform hysteria due to ethmoiditis, by Bulette; paralysis of the vocal cord caused by peritracheal tumor, by Chenery; laryngeal epilepsy, by Douglas; laryngeal chorea, by McCaw; tetany in recurring laryngeal polypi, by Canfield; paralysis of the soft palate following removal of tonsils and adenoids, by Roy; hysterical mastoiditis, by Shepherd; melancholia relieved by ethmoid operation, by Shields; angioneurotic edema of the esophagus, by Arrowsmith; angioneurotic edema of the larynx, by Halsted; Vincent's angina of the larynx, by Arrowsmith; coexistent carcinoma, tuberculosis and syphilis of the esophagus, by Dean; lipoma of the larynx, by Goldstein; exfoliation of external auditory canal, by Lederman; rapid necrosis of the temporal bone, by Packard; fibropapilloma of the larynx with unusual movements, by Loeb; subcutaneous emphysema of the neck and chest following tonsillectomy, by Rosenheim, and lipoma of the tonsil, by Theisen.

Instruments.—Many instruments have been added to our armamentarium by the Fellows of the society, as shown by their reports. Some have achieved a permanent utility, some have been discarded for one reason or another.

The more outspoken successes include the endoscopic instruments and appliances of Jackson and Mosher, Sluder's tonsillotome, Ballenger's swivel knife, Holmes' nasopharyngoscope, suspension appliances of Lynch, and Yankauer's suture instruments.

SECTION II. PERSONAL DIVISION.

We are now prepared to take up the contributions of the individual Fellows, making thereby a more personal study of the literature. No effort is made to include all papers; only those being selected which are of accepted influence in the literature being noted.

H. ARROWSMITH brought to the society reports of unusual cases, such as Vincent's angina of the larynx, angioneurotic edema of the esophagus and congenital tumor of the tongue. In more recent years his interest in direct laryngoscopy called for the papers on syphilitic peritracheobronchitis and lye strictures of the esophagus.

J. A. BABBITT showed a strong tendency towards pathology in his papers on the pathology of the faucial tonsil, on nasal polyps and their variation, and on the nasal turbinate as a vasomotor index. His paper on aphonia was presented at the last meeting.

W. L. BALLENGER. From the eighth to the nineteenth annual meeting Ballenger was of great influence. He covered a wide field and drew to himself many followers and admirers. His brilliancy and dash made him a leader for those twelve years. With new instruments to present and new operative methods to discuss at almost every meeting, he was for years the center of attraction of the younger and more aggressive Fellows. His subjects included mouth breathing, nasal deviation, paranasal sinuses. He was a very important factor in the popularization of the submucous resection and of the Sluder method of tonsillectomy. His swivel knife had an enormous influence in making the submucous resection available for those who were learning the special work. Its international use, already extensive, grows day by day. His last two papers manifested his keen interest in the new labyrinth researches of Barany and others.

W. C. BANE. Bane's papers have included tuberculosis of the ear and upper air passages, abortive treatment of acute mastoiditis, ear complications of influenza, tuning forks, Ludwig's angina, sarcoma of the nose, and personal hygiene of infancy and childhood. He presented a method of treating peritonsillar abscess by dissection of the anterior pillar, which he had found of great service.

JOHN F. BARNHILL. Barnhill's literary productions have been along borderland lines and major surgery, as evidenced by the subjects he has chosen, malignant disease of the paranasal sinuses, harelip and cleft palate, the fifth nerve, thyroid gland, trifacial neuralgia, otitic brain abscess, lateral sinus and jugular vein. His other papers are of a more conservative and didactic trend: remarks on chronic nasal sinus disease preceding operation and on cases and results of operation upon the nasal septum.

H. L. BAUM. Baum presented a most vigorous paper on the histopathology and histopathogenesis of benign nasal and paranasal growths.

J. C. BECK. The first paper read by Beck at the twelfth meeting upon the submucous resection of the septum, which was at that time a new operative procedure, made a distinct impression upon the Fellows. Since then his subjects have been most varied but always along investigative and advanced lines and major surgery. No one in the society has gone more extensively into the borderland, as is shown by the character of Beck's subjects: Surgery of external nasal deformities; surgery of the facial nerve; diseases of the salivary apparatus; Wassermann reaction and salvarsan in otolaryngology, with special reference to the affections of the auditory nerve; experiments with autolytic solutions in the treatment of inoperable cancer of the throat, neck and face; status of carcinoma with special reference to the head and neck; plastic surgery; cranial nerves; radium, X-rays and other nonsurgical measures combined with operations about the head and neck.

He has presented many papers upon pathology and laboratory work, including: Vaccine therapy in some suppurations of the nose and ear; laboratory methods as aids for diagnosis of nose, throat and ear affections; pathologic histology of nose, throat and ear affections; the pathology of otosclerosis; pathology of atrophic rhinitis, of the paranasal sinuses, of the nose and of the mastoid; roentgenographic diagnosis of otosclerosis. His other papers comprise the following: Frontal sinusitis, syphilis of the nose, atrophic rhinitis, further observations on some of the newer therapeutic measures in ear, nose and throat affections, removal of adenoids by direct inspection, cancer of the larynx with special reference to radium therapy, the treatment of malignant disease of the larynx and new diagnostic symptoms of sphenoid sinus disease.

T. PASSMORE BERENS. Major work was the basis of most of Berens' papers, such as cerebellar tumor, epithelioma of the middle ear, extradural abscess complicating chronic empyema of the antrum of Highmore, ethmoid labyrinth and sphenoid sinus, hemilaryngectomy for epithelioma, hypophyseal tumor, meningitis ambulanta. In several papers he developed the operation upon the maxillary, ethmoid and sphenoid cells by way of the maxillary route. Altogether he had the calm conception of surgery that made it possible for him to deal with extensive surgical procedures in an instructional way.

F. NOLTON BIGELOW. Bigelow had just begun a scientific life of great promise to the society when he was called from all earthly activity. His two papers on the types of mastoid structure, with special reference to their differentiation, will stand for many years as a model of the highest type of radiographic studies of the mastoid.

CLARENCE JOHN BLAKE. The contributions of Blake, who was for years the Dean of American Otology, were largely philosophic, although they were full of practical suggestions, as may be judged from their titles, as follows: Purulent affection of the labyrinth consecutive to disease of the middle ear; pathology, contour and contents of the epitympanum in relation to suppurative disease; consideration of the mechanism of pressure in the production of vertigo and report of cases; aid for the deaf, and war deafness.

J. PRICE BROWN. Brown's interest in sarcoma of the nose and paranasal sinuses and in nasal and postnasal synechiæ and stenosis of the larynx is well shown from the details of the papers which he contributed. His careful observations did much to stimulate interest in these conditions.

WILLIAM SOHIER BRYANT. Tinnitus aurium was the basis of three very important papers by Bryant. In addition, studies on mastoid operation and complications of the mastoid abscess, otosclerosis and the cochlea were made subjects for a number of well planned papers.

R. B. CANFIELD. Canfield's large experience justifies his consideration of radical surgery, as shown by the following subjects which he chose to present before the society: The application of radical surgery to chronic nasal accessory sinus disease; diagnosis and treatment of suppuration of the labyrinth; traumatic hemiplegia following fracture of the skull, with periodic loss of cerebrospinal fluid from the left frontal sinus, operation and recovery; some conditions associated with loss of cerebrospinal fluid, trifacial neuralgia and recurring laryngeal polypi with tetany. Probably the most interesting paper in the entire collection was the one in which he discussed the new operation for the radical treatment of chronic diseases of the antrum by submucous resection of the lateral nasal wall.

THOMAS E. CARMODY. During the last ten years in which Carmody has been active in the society he has won a place for himself in oral and plastic surgery and surgery of the neck. His papers on tuberculosis of the parotid gland and on the parotid gland in health and disease and on palate surgery form a distinct feature of these aspects of otolaryngology. In other papers he discussed malignant diseases of the head and neck, laryngeal tuberculosis, and relation of blood pressure to pathologic conditions of the head and neck.

WILLIAM WESLEY CARTER. Carter's papers have been confined entirely to the external nose. His intranasal splint, paraffin nasal splints and hot water splint for the nose have been found of service.

WILLIAM B. CHAMBERLAIN. Chamberlain brought the endonasal operation of the lacrimal sac to the notice of the society. His other papers have also been well received: Practical points in extirpation of the tonsils, fibroma of the nasopharynx, nasal polypi involving the orbit, frontal sinus and anterior fossa of the skull, cyst of the larynx, treated through suspension laryngoscopy, latent mastoid suppuration with perisinus abscess and difficulties encountered in removing a peanut from the bronchus.

CORNELIUS G. COAKLEY. With the exception of a paper on melanosarcoma of the nose, Coakley's work in the association has been confined to the paranasal sinuses, and it has been of such importance that its influence has been felt by all the Fellows. Of particular value must be mentioned his contributions on chronic empyema of the antrum, the sphenoid sinus, frontal sinusitis and skiagraphy as a means of determining the size of the frontal sinus.

FREDERICK C. COBB. The field covered by Cobb includes: Antral empyema, dentigerous cysts, peritonsillar abscesses, malignant growths of the nose and pharynx, abscess of the tongue, end results of submucous resection and atrophic rhinitis from the bacteriologic standpoint and its treatment by vaccines.

LEWIS A. COFFIN. No one has had more influence than Coffin by his practical papers, largely on the paranasal sinuses. His manner of presentation and the manifest sincerity of his work have inclined the Fellows to accept the validity of his

findings. He was interested early in sinusitis in children. He presented a paper on this subject before the tenth annual meeting. In addition he prepared papers on deductions from a study of unilateral nasal stenosis, and teratoma of the nasopharynx.

LEE COHEN. Very valuable contributions have been made by Cohen in his three papers on the correction of external nasal deformities. The last paper has been helpful to those interested in recent fractures of the nose.

GERHARD H. COX. The experimental side of our work has been the chief interest of Gerhard H. Cox, whose contributions have been marked by most extensive study. They include: Status lymphaticus, effect of various atmospheric conditions on the upper respiratory tract, isolation and cultivation of the tubercle bacillus from a discharging ear and the effect of mustard gas poisoning upon the upper air tract.

WILLIAM LEDDIE CULBERT. Culbert covered the following subjects: Abscess of the septum, papilloma of the larynx, maxillary sinusitis, followed by septic pemphigus and death, and the use of radium in malignant growths of the nose.

H. HOLBROOK CURTIS. The well known position of Holbrook Curtis among those concerned with vocal music made him an authority on such subjects in the society. His first paper was on the cure of singers' nodules. He presented no other papers on voice production or the pathologic relations of the singing voice except the one on acute laryngitis of singers and its abortive treatment. His contributions covered a very wide field, all more or less unusual, some in their subject matter and some in their presentation. They comprise mainly paranasal sinus disease and such subjects as rhinodema, epistaxis, chronic vasomotor rhinitis and immunizing cure of hay fever. It was in this last paper that he discussed some experiments he had made on the treatment of hay fever that were in some measure suggestive of the later work that has been done on the subject.

EWING W. DAY. In the main, Day's papers have been confined to ear conditions and to major larynx work. Many interesting reports on cases were presented, which showed careful studies and most thoughtful conclusions. His work with Jackson on otitis media complicating typhoid fever, read at the

tenth session, was one of the most outstanding contributions presented to the society. Three other papers on typhoid conditions were presented, the result of the typhoid fever epidemic in Pittsburgh in the early part of the present century. It was characteristic of Day that he should present a paper on eight cases of purulent meningitis operated upon by the Haynes method with postmortem findings of five.

L. W. DEAN. Dean's work began with the twenty-second session, and since that time he has made an enviable place for himself among the Fellows of the association. The following is a list of his papers: The control of hemorrhage in more extensive operations of the nose and jaws, coexistent carcinoma, tuberculosis and syphilis of the esophagus, bilateral, congenital, osseous atresia of the external auditory canal with exceptionally good functional result following operation. Dean presented four papers on paranasal sinuses in children which have stimulated the interest of the association in this subject, and he has virtually controlled the practice of the Fellows in this connection. In his President's Address at the twenty-seventh meeting he presented studies on the audiometer which have stimulated many other investigations on the subject. His work has always been along advanced lines.

E. B. DENCH. Dench has contributed a paper every year at the meetings of the society or its sections, with the exception of the eleventh, fifteenth, seventeenth, twentieth, twenty-second, twenty-fifth, twenty-sixth and twenty-seventh, and they have all been papers of exceeding value. They were all confined to otology. They have been papers that were didactic, instructive, comprehensive, with reports of many cases, from which conservative and logical deductions were made. The subjects included: Mastoid and intranasal complications, sinus thrombosis, chronic suppurative otitis media, labyrinth suppuration, cholesteatoma, differential blood count and bacteriologic examination of aural discharge.

WILLIAM H. DUDLEY. Has presented studies on cholesteatoma, the lingual tonsil, parosmia, anosmia, cerebral abscess and adenocarcinoma of the paranasal sinuses.

ARTHUR B. DUEL. Early in the society's history Duel presented his method of electrolytic dilatation of the eustachian tubes in chronic tubal catarrh and chronic catarrhal otitis

media, and he advocated this method of treatment for a number of years, presenting papers to show its value. His other papers dealt with mastoid complications, labyrinthectomy and stenosis of the larynx.

JAMES GARFIELD DWYER. Although Dwyer has read but one paper before the society, it was a distinct contribution to the bacteriology and immunity studies in connection with eye, ear, nose and throat infections.

WELLS P. EAGLETON. Eagleton has contributed two great papers, one on the reconstruction of the mastoid wound cavity by the use of bone grafts and chips, and the other on the vestibular reactions.

F. P. EMERSON. In addition to papers on fatal results from sphenoid operation, atrophic rhinitis and labyrinth vertigo, Emerson has stimulated interest in the study of progressive deafness by his papers, which have been most exhaustive and which have brought the subject before the profession with a renewal of interest.

GEORGE FETTEROLF. Only two papers have been presented by Fetterolf, both early in the society's history: The simple method of correcting certain deformities of the nasal septum and reflex cardiac inhibition resulting from irritation of the peripheral fibers of the trifacial nerve.

LEWIS FISHER. The vestibular tests constitute the subject for the two papers presented by Lewis Fisher, which are most important studies in this connection.

EDMUND PRINCE FOWLER. Fowler's work has been investigative in its character and includes the following subjects: The observation of nystagmus through the closed eyelids, the effect upon the endolymph of the static labyrinth of local autogenous temperature variations, drum tension and middle ear air pressures; their determination, significance and effect upon hearing; the restoration of tubal function; audiometric methods and their applications.

IRA FRANK. He presented three important papers: Non-diabetic acidosis, with special reference to postoperative acidosis in children, technic of plastic surgery of the face and invisible scar method in cosmetic nasal surgery.

W. FREUDENTHAL. The papers of Freudenthal have been concerned with the more general relation of otolaryngology,

such as rheumatism of the nose, endobronchial treatment of asthma, the pathogenesis of bronchial asthma. Tuberculosis in its various aspects has constituted a large portion of his contributions, as shown in the following: Clinical treatment of tuberculosis of the upper air tract, the baneful influence of pregnancy on laryngeal tuberculosis, laryngitis dolorosa, the possibilities of curing advanced laryngeal tuberculosis. Other papers of great interest are electric light in diseases of the respiratory organs, radium in the treatment of the upper air passages, three papers on radical frontal sinus operation and suspension laryngoscopy.

STANTON A. FRIEDBERG. Dr. Friedberg's all too short life in the society was, however, productive of two very important papers on the etiology, diagnosis and treatment of the aural complications of the exanthemata and the removal of tonsils and adenoids in diphtheria carriers.

THOMAS J. GALLAHER. Gallaher's papers covered a variety of conditions: Surgery of the faucial tonsil, tooth cysts, surgery of the frontal sinus, Ludwig's angina, and nasal status in retrobulbar optic neuritis.

PERRY G. GOLDSMITH. Goldsmith is responsible for two very practical papers, one on submucous resection and the other on the after treatment of nose, throat and ear operations.

M. A. GOLDSTEIN. In addition to Goldstein's studies in re-education of the deaf, he has presented a number of important contributions upon certain plastic operations and reports of interesting cases. They include the following: Tuberculosis of the middle ear, ear complications and sequelæ of influenza; the use and abuse of the eustachian bougie; the otologic aspects of Recklinghausen's disease; perforation of the nasal septum; cosmetic plastic surgery of the ear; malignant growths of the mouth and pharynx; cyst of the tonsil; lipoma of the larynx and the use of normal horse serum as a means of controlling hemorrhage in otolaryngology.

CHARLES P. GRAYSON. In addition to two papers on the sphenoid sinus, Grayson has presented papers on more general topics, such as toxic rhinitis, neuroses of the nose, chloroform anesthesia in nose and throat surgery, chorus girls' vocal troubles and our American voice and articulation.

T. H. HALSTED. The reports made by Halsted exhibited an interest in major surgery in the main, such as sarcoma of the larynx and sarcoma of the nasopharynx, recurrent papilloma of the larynx, foreign bodies in the larynx and bronchus, abscess in the temporosphenoidal lobe. He was one of the earliest of the Fellows to report blindness due to empyema of the paranasal sinuses with operation resulting in recovery of sight. He called attention to the danger of chloroform as an anesthetic in adenoid operations and reported a very interesting case of angioneurotic edema. His paper on foreign bodies was presented at the eighth annual meeting, which was held before the advent of the bronchoscope. Since that time he has manifested his interest in bronchoscopy by his paper on the practicality of bronchoscopy and esophagoscopy.

THOMAS J. HARRIS. Harris' contributions all have messages to transmit and cover a very wide field, particularly in the otologic portion of our work. They comprise the following: Thrombus of the lateral sinus, the use of the electro-bougie, tinnitus aurium, prognosis of chronic catarrh of the throat and ear—some remarks by a would-not-be pessimist, temperature after mastoid operation, prognosis of chronic suppurative otitis media, pathologic findings of intracranial complications of middle ear diseases, prognosis of deafness due to chronic nonsuppurative diseases of the middle ear, atypical mastoiditis, auditory reeducation, uncontrollable hemorrhage following mastoidectomy from purpura, nasal hemorrhage, dysphagia and dysphonia of dental origin and angioma of the larynx.

W. H. HASKIN. Haskin succeeded in bringing to the association a clear understanding of the relation which other organs, more particularly the mouth, bear to ear, nose and throat conditions. His papers on dentigerous cyst, fibromyxoma involving the superior maxilla, gateways of cryptogenic infection of the alveolar process, all had this incident as their basis. In addition to this he presented papers on epithelioma of the tympanic cavity, ocular manifestations in nasal and aural diseases which probably indicate involvement of the sympathetic nervous system, Hiss leucocyte extract in complications of nasal and aural surgery, demonstration of the "vacuum cleaner" in nasal practice.

HILL HASTINGS. Hastings concerned himself in his papers with subjects which his wide experience justified, such as vestibular reactions of the normal labyrinth, ocular symptoms of nasal origin, indications for the mastoid operation, mucocoele of the nasal accessory sinuses and the Meniere symptom complex.

CHRISTIAN R. HOLMES. Every paper presented by Christian R. Holmes was authoritative in its character, and in the main constituted an example for subsequent papers on similar subjects. They were as follows: Enormous nasopharyngeal soft fibroma, hysteria of the ear, diseases of the nasal accessory sinuses and their relation to pathologic changes of the eye and orbit and presentation of hypophyseal tumor cases.

EDGAR M. HOLMES. The association was the medium through which Edgar M. Holmes established the value of the nasopharyngoscope devised by him. The three papers in which this instrument was brought forward are the examination and treatment of the eustachian tube by the aid of the nasopharyngoscope, the eustachian tube in chronic otitis media, and intranasal treatment of Meckel's ganglion. Previous to this he had presented important papers on suppuration of the frontal, ethmoid and sphenoid sinuses, middle ear suppuration as an etiologic factor in retropharyngeal abscess, a dermoperiosteal flap in radical mastoid operation, malignant disease of the nose and carcinoma of the uvula.

HENRY HORN. Henry Horn was just beginning to be of service to the society when he was called away. His papers on the bacteriology of the so-called coccobacillus fetidus ozenæ and the vaccine treatment of ozena were classical in their presentation and in the consistent, investigative spirit which characterized their preparation.

THOMAS HUBBARD presented papers on pyogenic brain diseases, obstruction of the eustachian tube as a factor in post-operative mastoid fistula and in chronic suppuration of the middle ear, a method of precision for inflating the tube and tympanum, accessory sinus suppuration in scarlatina, and an unusual type of laryngeal edema.

LEE M. HURD. Hurd's work in the society has been along practical lines and includes a method of medicating eustachian bougies, treatment of acute sinus infections, differential diag-

nosis of tuberculosis and syphilis of the upper respiratory tract, reports of adenocarcinoma of the maxillary antrum, adenocarcinoma of the nose and mycosis of the throat.

E. FLETCHER INGALS. Ingals was represented by only five papers, but all of them were of paramount importance. His new operation with instruments for drainage of the frontal sinus has long been considered a masterpiece of careful work and surgical ingenuity. His papers on chronic laryngitis and on the treatment of hypertrophic and intumescent rhinitis, which were read nearly twenty years ago, are still worthy of acceptance. He became interested in bronchoscopy when somewhat advanced in years. This, however, did not deter him, and his papers on bronchoscopy and esophagoscopy and upon direct laryngoscopy were the result of his careful observation and practice.

JOHN M. INGERSOLL. The anatomy and physiology of the paranasal sinuses constitute the most important studies of Ingersoll, as shown in his papers on the nose and its accessory cavities in the American bear, the function of the accessory cavities of the nose. He is responsible for four other papers: Spasmodic torticollis following an adenectomy, supernumerary teeth in the nose and in the maxillary sinus, semicircular canals with a report of the subsequent labyrinthine reaction and some points in the comparative anatomy of the nose and the accessory sinuses which account for the variations in these structures in man.

SAMUEL IGLAUER. Iglauer's papers have shown his interest in bronchoscopy and laryngeal and esophageal stenosis and in the investigative side of otolaryngology. His first paper on the X-ray examination of the mastoid region stimulated the Fellows in this direction. Some attempts at the intranasal transplantation of nasal tissue, a simple method of fixation of intubation tubes, some original methods of treatment of laryngeal stenosis and a demonstration of the physics of suction applied to the nose showed his originality and investigative spirit. His other papers comprise: A case of scleroma, accidental pneumothorax during tracheotomy, X-ray diagnosis of unusual laryngotracheal and esophageal conditions and diseases, and he reports two foreign body cases.

CHEVALIER JACKSON. Jackson's first paper before the society was a modest one on failures in attempting correction of septal deviation, which he read at the eighth meeting. At the ninth meeting he exhibited instruments, and at the tenth meeting he demonstrated his head lamp and reported a case of tonsillolith. The tenth meeting, however, was marked by two very important contributions on the part of Jackson: (1) Primary malignant disease of the larynx, which was a carefully planned, comprehensive and almost authoritative discussion of the subject. (2) An equally comprehensive paper, by Day and Jackson, on acute purulent otitis media complicating typhoid fever. This last paper was really a marvel of completeness of observation and logical conclusions and is still accepted as the classical exposition of the subject. These two papers at once gave Jackson a standing among the Fellows. At the next meeting he presented his first work in bronchoscopy. From that time on he has been the American and international authority on this subject. His most important papers have been presented before this society and they cover every range of the subject. It is fitting that at the last meeting he presented his entire experience in foreign body work so comprehensively and so instructively that it must continue for years as the basis of future study. He has not limited himself, however, to foreign body work. He is responsible for much of the new work done in laryngostomy, and his papers on this subject, and on the major surgery of the larynx particularly, are characterized by the same spirit which animates his other work. In his contributions he has not forgotten the instructional side of his duties. Usually on that account they have been and will be more serviceable. There is no one who represents the spirit of this association in a higher sense than Chevalier Jackson.

D. C. JARVIS. The paper read by Jarvis on the upper respiratory tract in granite dust inhalation at his first meeting, two years ago, made an impress which was not in the least reduced by his paper read last year on the effect of roentgenray therapy upon impaired hearing.

J. W. JERVEY. Jervy's papers have been mainly practical. He has discussed the following subjects: Tonsils and adenoids, syphilitic hypertrophy of the inferior turbinates, eustachian

irrigation in mastoid operations, malignant tumor of the larynx, surgical requirements of the nasopharyngeal adenoid, monocular retrobulbar optic neuritis caused by purulent maxillary sinusitis and practical tonsil hemostatics.

ISAAC H. JONES. The Fellows all came to know Jones when he gave his moving picture demonstration on the technic of the examination of the vestibular apparatus at the twenty-third session. He became better known the following year, when he read his paper on the value of ear examination to the neurologist and thus prepared himself for his aviation work in the army.

GEORGE F. KEIPER. The papers presented by Keiper have all been characterized by a close study of his subject from the standpoint of literature, personal experience and logical conclusions. They include a wide range: The facial nerve, spontaneous hemorrhage from an inflamed tonsil, atrophic rhinitis, nonsurgical treatment of suppuration of the temporal bone, abscess of the nasal septum, strictures and diverticula of the esophagus, bronchoscopic treatment of spasmodic asthma, acute mastoiditis with an enormous leucocyte count, the tonsil question and tight strictures of the esophagus due to lye burns.

PHILIP D. KERRISON. All of Kerrison's papers are devoted to otology, three being on the labyrinth, one on acute mastoiditis and the fifth on malingering in defective hearing.

S. J. KOPETZKY. Kopetzky's great work was the study of meningitis, which was presented at the eighteenth meeting and which was awarded the society's gold medal. These studies were made in connection with the operative treatment of meningitis through the cisterna magna for which Haines was responsible. His other papers were on the radical mastoid operation, suppurating middle ear diseases of infancy and childhood.

D. BRADEN KYLE. For seventeen years Kyle's influence, which was conservative and yet receptive of advanced work, had a marked influence in shaping the character of his literary productions. His paper on the import of the salivary and nasal secretions in hay fever, though perhaps it has not been borne out by subsequent work, was one that showed great scientific understanding and study. This was also to be noted in the papers on taking cold and chemic diseases of the upper respir-

atory tract. In addition to these he discussed the following subjects: Certain varieties of nasal deflections and redundancy, manifestations resulting from infections of the adenoids, pathology of malignant growths of the upper air passages, acoustics of the mouth and relation of the individual's voice to hearing.

ROBERT LEVY. Levy read his first paper at the second session, the subject being pharyngeal tuberculosis, and at once became an authority for the society on tubercular manifestations of the upper respiratory tract. He subsequently presented the following papers on this subject: Effect of climate on laryngeal tuberculosis, treatment of laryngeal tuberculosis, tuberculosis of the upper air passages and the ear, tuberculosis of the mouth, laryngeal tuberculosis, antitubercle serum. He, however, has not confined himself to tuberculosis, as evidenced by his papers on serious consequences following intranasal operations, one of the first papers calling attention to this subject. The relation of diseases of the stomach to affections of the mouth, nose and throat, submucous resection of the nasal septum, vaccine therapy, etiology relation of diseases of the ear, nose and throat to diseases of the heart, lungs and blood vessels, differential diagnosis between Vincent's angina and primary syphilitic lesion of the tonsil, suspension laryngoscopy in children, nasopharyngeal polypus, esophagotracheal fistula and nasal accessory sinus disease.

H. W. LOEB has presented the following papers on anatomy: (1) Study of the anatomy of the accessory cavities of the nose by topographic projections. (2) Anatomic relations of the optic nerve to the accessory cavities of the nose. (3) Cubical capacity and superficial area of the sphenoid, maxillary and frontal sinuses. He has presented the following papers on focal infections: Acute nephritis following acute tonsillitis, the borderland of otolaryngology and ophthalmology, two cases of blindness relieved by ethmoid exenteration, a case of keratoiritis due to tonsil infection. He has also presented two papers on fatalities following operations on the nose and throat not dependent upon anesthesia, a paper on rhinopharyngeal fibroma, one on fibropapilloma of the larynx with unusual movements and one on serum treatment of hay fever.

JAMES E. LOGAN. Logan's most important contributions have been those on acute suppuration of the middle ear, syphilis of the nose and upper air passages and bullet wound of the mastoid.

HENRY LOWNDES LYNNAH. Henry L. Lynnah was elected a member of the society at its twenty-first session and continued his membership for five years when he was called away from his earthly home. The society lost in this way one of the most promising and brilliant members that ever graced its roster. In these five years he presented five papers and in addition exhibited instruments on three other occasions. All of these pertained to endoscopy and to treatment by endoscopic methods. His first paper on tracheobronchial diphtheria startled the entire society, for he applied the endoscopic plan to the removal of diphtheria exudate from the trachea and bronchus and virtually saved scores of children from certain death. When we realized the closeness of his contact to these contagious exudates and the painstaking care, technic and heroism which the removal of this exudate implied, it was easy to understand how those who are interested in science and humanity became devoted to him. His subsequent work, two years later, on the same subject justified the hopes which his first work promised. His three other papers on the intubational tubes, foreign bodies in the bronchi and esophagus and borderland diseases of the esophagus left no doubt as to his high standing in the science of medicine. The world lost much when he was called away.

ROBERT CLYDE LYNCH. Lynch may be considered as having developed in the society a technic of suspension laryngoscopy as applied to laryngeal work, and soon after his first paper, which was read at the twentieth session, he became the most influential exponent of this technic. His paper on the removal of intrinsic growths of the larynx showed surgical acumen that could not be denied him. His method of suture and of excision with knives through the medium of suspension laryngoscopy was most effective. He presented the technic for radical frontal sinus operation at the twenty-sixth session, which has given much promise for improvement in operations of this sort.

JOHN EDMUND MACKENTY. Although but a short time a member of the association, MacKenty's work stands out in major surgery as being of the highest import. In this regard

his subjects include hemilaryngectomy for malignant disease, a plea for inclusion of neck surgery in laryngology, an improved technic in the operation for cleft palate. In addition to these he contributed a paper on chronic sinusitis with toxic manifestations.

GEORGE W. MACKENZIE. MacKenzie's work in the society has been mainly along the line of the physiology of the labyrinth and eighth nerve, his subjects being after turning nystagmus, galvanic method of testing the functions of the inner ear and eighth nerve, neuritis of the eighth nerve. In addition to this he has presented his studies on motor neuroses of the larynx and on the subdural cyst of the frontal lobe.

G. HUDSON MAKUEN. Makuen was the first fellow to call attention to the subject of speech defects in his paper presented at the second meeting of the society. From that time on he became, as it were, the doctrinaire on this subject, presenting altogether twelve papers, fully justifying his position in the society in this regard. He has been, however, much interested in the tonsil, presenting two papers on the tonsil, one at the third session and another at the twenty-first session. The last paper defined his technic for preserving the pillars, which has been found serviceable by many of his followers.

JAMES McCaw. McCaw has presented a number of very practical papers on tuberculous otitis media, influenza as a causal factor in acute mastoiditis, primary epithelioma of the uvula and soft palate, laryngeal chorea, mastoiditis, orbital and meningeal infection from the ethmoid cells, nondiphtheritic membranous pharyngitis and rhinitis, submucous resection of the nasal septum, a gliosarcoma of the left lobe of the cerebellum giving external symptoms of mastoiditis.

JOHN MCCOY. Five papers have been presented by McCoy, including: Submucous resection, brain abscess in the frontal lobe secondary to ethmoiditis and frontal sinusitis, benign laryngeal growths, brain abscess following middle ear and mastoid infections and cancer of the tonsil.

JOHN F. MCKERNON. Almost from the very beginning McKernon has been instrumental by his contributions in establishing an understanding of the relation which suppurative otitis media bears to the mastoid processes, intracranial and general conditions. A list of his papers brings this out most

forcibly: Sinus thrombosis, intracranial abscess, abortive treatment of acute mastoiditis, brain abscess, temporosphenoidal abscess, complications of suppurative otitis media, chronic mastoiditis and jugular bulb thrombosis, primary involvement of the jugular bulb following an acute attack of otitis media, sigmoid sinus thrombosis, recurrent mastoiditis: its cause and prevention, postoperative effects of the Stacke operation and vaccine therapy in mastoiditis.

RICHMOND MCKINNEY. McKinney, one of the more recent members, has presented important papers on lateral sinus thrombosis, tonsillectomy by the Sluder method and phases of esophageal stenosis.

JOHN O. McREYNOLDS. McReynolds' broad experience is reflected by his papers on bulbar paralysis, glosso-labio-pharyngo-laryngeal paralysis, multiple papillomata in mother and child, othematoma and chronic perichondritis of the auricle, sarcoma of the nasopharynx, hemorrhage in nasal operations, foreign body in maxillary antrum, intranasal abscess with complete monoplegia, persistent delirium, operation and complete recovery and spontaneous radical mastoid operation.

FRANK E. MILLER. Three papers on the vocal side of our work have come from the pen of Frank E. Miller: Corditis cantorum, research on the cause of vocal nodules and vocal art science.

HARRIS PEYTON MOSHER. From the submission of his thesis on the tonsil at birth, at the ninth congress, up to the present time, Mosher has had a commanding influence in the scientific development of the association. His investigative work, which has been presented to this society, was shown in his papers on: Premaxillary wings and deviations of the septum, stenosis of the esophagus, relations and variations of the lower end of the esophagus. One of the first men to study bronchoscopy and esophagoscopy, his contributions to this department of our work have been most serviceable. His instruments have been numerous, valuable and permanent additions to our armamentarium. His response to the country's call during the world war resulted in his being placed at the head of the otolaryngologic service in the Surgeon General's office, and as such his work is shown in his report on otolaryngology in the first year

of the war, which was submitted at the twenty-fourth annual meeting.

W. V. MULLIN. A very recently admitted member, Mullin has already shown his ability to advance the interest of the society by his papers on the lymph drainage of the accessory nasal sinuses, relation of sinus disease to diseases of the chest, accessory sinuses as etiologic factors in bronchiectasis and analysis of some cases of tubercles in tonsils.

CARL E. MUNGER submitted three very interesting papers on Stenson's duct, an unusual case of nasopharyngeal adenoids and orbital infection from the ethmoid cells.

JOHN W. MURPHY. Murphy's first paper was in connection with coronal and sagittal sections, showing the relations of the sphenoid sinuses which he had made. This was followed by one on brain infection of otitic origin. His last three papers were devoted to endoscopy, in the practice of which he had become most proficient.

ROBERT C. MYLES. Myles, the first Secretary of the association, can be given credit for the first important surgical studies of the paranasal sinuses made in this country. His first paper on diseases and treatment of the accessory sinuses, with an analytical report, was a continuation of a paper which he had presented previously. He contributed related papers on the surgery of the middle and inferior turbinates, diseases of the accessory sinuses, polypi of the antrum, surgical management of diseases of the frontal sinuses, all of which reflected the importance of his early observations. In addition to these he has made constructive additions to the literature by his papers on traumatic hemorrhage from the nose and pharynx, faucial tonsils, nasal adhesive tissue stenosis, subglottic growths, diseases of the salivary ducts and glands, pathology and treatment of recurrent quinsy. The last paper was a most startling one on the use of aspiration or vacuum suction apparatus in cases where the ability to swallow or cough has been partially or completely lost and the patients are being practically drowned in their own secretions.

G. B. NEW. Though a member but four years, New has presented three papers on the treatment of malignant tumors of the antrum, actinomycosis of the tongue and delayed flap in secondary operation on the palate and antrum.

SEYMOUR OPPENHEIMER. The list of Oppenheimer's papers includes: Primary epithelioma of the uvula, venous system of the temporal bone, hyperplasia of the lingual tonsils, mastoiditis with paralysis of facial nerve, recovery following operation, mastoiditis and temporosphenoidal abscess, pollinosis and blood examination in surgery of the nose and throat.

FRANCIS R. PACKARD has presented the following: Difficulties attendant upon the proper treatment of diseases of the ear in dispensary practice, rapid necrosis of the temporal bone following scarlet fever, syphilitic manifestation in the larynx and trachea, clinical aspects of deafmutism, laryngeal neoplasm, and meningitis.

JAMES ALLEN PATTERSON. In addition to his paper on the climate of Colorado, etiologically and therapeutically considered, Patterson has written on ocular diseases of nasal origin, the septic bathing pool and ethmoiditis in children.

WENDELL C. PHILLIPS. Most of the contributions of Phillips have been in otology, although he has presented papers on epithelioma of the antrum, glandular complications of acute follicular and acute suppurative amygdalitis, melanotic sarcoma, edematous nasal polyp, angioma. His ear papers are very numerous, comprising the following: Three hundred and fifty cases of ear diseases, carbolic acid in the treatment of mastoid wounds and chronic middle ear suppuration, lateral sinus thrombosis, symptoms pointing to the necessity for operative interference in mastoid suppuration, bacteriologic examination in suppurative otitis media, outfit for mastoid cases, relation of middle ear suppuration to life insurance, analysis of the radical operation in one hundred twenty-three cases of chronic suppurative otitis media, lateral sinus thrombosis complicated by typhoid fever, electrical noise producer, etiology, pathology, symptoms and diagnosis of phlebitis and thrombosis of the blood vessels when complicating purulent otitis media and persistent otorrhea in infants and young children.

NORVAL H. PIERCE. Pierce has a very important list of papers, which have been well received by the Fellows and which have exerted a considerable influence upon them. Anatomy and physiology of the tonsil, exenteratio cavi tympani, congenital fistula of the external nose, acute suppurative otitis media, cholesteatomatous disease of the tonsils, frontal

sinus disease, radical operation of the paranasal sinuses, foreign body in the esophagus, new method of closing the eustachian tube in the radical mastoid operation.

H. O. REIK. Reik, with Blake, Sprague and Christian Holmes, has been the chief exponent of the blood clot dressing in mastoid operation. Besides this, he has presented papers on: Labyrinthitis, percentage of cure from tympanomastoid extirpation, effect of tobacco on the ear and upper respiratory tract, cerebral tuberculosis and items of progress from the literature of otorhinolaryngology.

GEORGE L. RICHARDS. For many years Richards has been editor of the transactions and as such has been able to keep in close touch with the progress of the association from the standpoint of its literature. He has covered a very wide range in his papers on: Perichondritis of the larynx, the facial nerve, gelatoglycerin bougies for earache, traumatic rupture of the tympanic membrane, cerebral abscess of otitic origin, radical surgery in chronic suppurative otitis media, aural neuralgia of dental origin, choice of treatment in chronic suppurative otitis media, radical mastoid operation with a description of the technic of Heath, Bondy, Siebenmann, reflex cough, hay fever, empyema of the frontal sinus, postnasal polypi and the tonsil.

JOHN D. RICHARDS. The more radical surgery of the ear has been the subject of most of John D. Richards' discourses, including: Radical mastoid operation, surgery of the labyrinth and cerebellar abscess. His labyrinth operation, described at the thirteenth annual meeting, has occupied an important place in the major surgery of the ear.

C. W. RICHARDSON. No man in the association has presented so many varied titles as Richardson and no one has made as many practical suggestions. The best evidence of this is a statement of the subjects which he has selected, which include: Hemorrhage from the external auditory canal, laryngectomy, deflected nasal septum, asthma as a reflex manifestation from abscess of the antrum, pathology of adenoid growths, mastoiditis, keratosis of the fauces, three cases of simultaneous operation for double mastoid abscess, etiology, pathology and symptomatology of chronic suppurative otitis, hypoglossic laryngitis, osteomyelitis of the temporal bone, carcinoma of the larynx, papillomata of the larynx, Vincent's angina, foreign body in

the bronchus, tonsillectomy by finger dissection, observations on intranasal surgery, abscess of the lung following operation on the tonsils, ear protectors, and reeducation and reconstruction of defects of hearing and speech. His last paper gives a résumé of his work as head of the department of speech defects in the U. S. Army during and after the war.

W. H. ROBERTS. Has presented an interesting set of papers on thoroughness in removal of diseased tonsils, meningitis with peculiar ear symptoms, status lymphaticus, tonsillectomy and multiple aneurism at base of brain.

JOHN O. ROE. Only two papers were presented by Roe, both on the subject in which he had made an international name for himself, namely, deformity of the nose resulting from lupus, corrected by the subcutaneous method and the correction of nasal deformities.

SYLVAN ROSENHEIM. The forceps for control of tonsillar hemorrhage, presented at the sixteenth annual meeting by Rosenheim, has been found of great value. His other subjects were: Tonsillar ring and the paranasal sinuses as portals of entry of infectious diseases, submucous resection and subcutaneous emphysema following tonsillectomy.

DUNBAR ROY. All of Roy's papers have been characterized by a complete résumé of the literature of his subject. They stand out in this particular as models which many might follow with profit. His papers comprise the following: Angioneurotic edema, chronic nasopharyngeal bursitis, laryngeal papillomata, exploratory puncture of the drum membrane, malignant disease of the sphenoid, inflammation of the external auditory canal followed by bilateral sinus thrombosis, partial paralysis of the soft palate following removal of tonsils and adenoids, nasal case probably due to syphilis, sarcoma of the nasopharynx, paralysis of the external rectus in the right eye following mastoiditis on left side, radium in the treatment of epithelioma of the nasal cavities, polyarthritis complicating mastoiditis, and nasal analgesia as a prognostic symptom in progressive deafness.

WILLIAM E. SAUER. Two papers of importance were presented by Sauer: Causation of suppuration of the temporal bone and end results following operations for chronic sinus disease.

JACOB E. SCHADLE. The most important paper presented by Schadle was on the antrum of Highmore as an etiologic factor in the production of hay fever, which at the time was well received. His other papers were on torticollis and adenoid growths and the significance of edema of the pharynx.

WILLIAM SCHEPPEGRELL presented five interesting papers during the first five years of the society's existence: Rhinoliths, X-rays in rhinologic work, treatment of suppurative diseases of the accessory sinuses of the ear by ozone gas, perichondritis and necrosis of the arytenoid cartilage and mucocele of the maxillary sinus.

GEORGE E. SHAMBAUGH. Much of Shambaugh's work was done in other societies, and although his contributions have not been many they have been most effective. They include: Tonsils in relation to general infection, primary disease of the labyrinth as the result of focal infection, ear complications of the influenza epidemic at Camp Grant and normal histology of the internal ear.

J. E. SHEPHERD. All of Shepherd's papers were practical in character and were the result of careful clinical observation. The titles are as follows: Hysterical mastoiditis, some everyday ear cases, otitis media mucosa, otitis media purulenta chronica, use of Siegel's otoscope in middle ear affections, affections of the external auditory meatus, clinical significance of bacteremia.

ROSS HALL SKILLERN. No man in America has contributed more to the understanding of paranasal sinuses than Skillern, and the subjects selected for his papers in this association are characteristic, as follows: Bone cysts of the middle turbinate, roentgen ray as an aid to the diagnosis of sphenoid sinus diseases, osteomyelitis involving the superior maxillary, malar, frontal, ethmoid and sphenoid bones, present status of skiagraphic interpretation as an adjunct in the diagnosis of catarrhal affections of the accessory sinuses.

GREENFIELD SLUDER. The two papers read by Sluder were based on his method of tonsillectomy, which is almost worldwide in its employment. It is certain that this is one of the most conspicuous achievements of any member of the society.

S. MACCUEN SMITH. MacCuen Smith has confined his papers to otology and has touched on most of the important

conditions which come under the observation of an aurist: Chronic nonsuppurative otitis media, Meniere's disease, acute suppurative otitis media, Bezold's variety of mastoid disease, meningitis, radical mastoid operation, fibrochondroosteoma of the mastoid antrum, primary mastoiditis, chronic recurrent suppurative otitis media and its relation to mastoid and intracranial complications and primary mastoiditis with objective tinnitus aurium, Heath operation, cerebral lesions complicating suppurative otitis media, myxedema, otitic brain abscess, end results of the radical mastoid operation.

S. E. SOLLY. Solly's short experience in the association was productive of two important papers, one on tubercular laryngitis and the other on carcinoma of the larynx.

FRANK R. SPENCER. Spencer's papers are characterized by a very close study and comprehensive understanding of medical literature. They comprise: Transillumination of the larynx and upper trachea, epitaxis, exenteration of the anterior ethmoid cells, roentgenology of the mastoid and laryngeal tuberculosis.

FRANK B. SPRAGUE. At the eleventh annual session of the association Sprague presented two papers that were markedly effective: Tympanomastoid exenteration with blood clot dressing and scarlatinal otitis.

OTTO J. STEIN. Four notable papers have come from the pen of Stein: Leukoplakia buccalis, lymphosarcoma of the pharynx, diaphragmatic closure of the esophagus, hypophyseal growth operated through the nose and sphenoid, and hay fever.

J. A. STUCKY. The writings of Stucky have been a feature of the association since its very beginning. Notwithstanding the fact that his activity has been limited to a small community he has covered almost the whole field, presenting many unusual cases, many personal methods and much material that represented close study and observation. His paper on sudden death following removal of tonsils at the fifth session called early attention to this possibility and his willingness to report fatalities has been a good example to others. Among his reports of this sort may be mentioned: Chronic suppurative ethmoiditis, sarcoma of the right temporosphenoid lobe, traumatic ethmoiditis with cerebral abscess, meningeal and cerebral complications as a result of ethmoid, sphenoid and frontal sinus

disease, untoward after effects of too radical tonsillectomy, and injury to inferior and middle turbinals in operation for deviated septum. His other papers include: Maxillary sinusitis, lithemic pharyngitis, cocklebur in the bronchus, Bezold mastoiditis, syphilitic manifestations in nasopharynx, intracranial diseases of otitic origin, intestinal autointoxication as a factor in the causation of pathologic conditions of the ear, nose and throat, exfoliation of the bony tympanic wall, and the semicircular canals, atypical mastoiditis, papilloma of the larynx, after treatment of radical operations in otorhinology, modified radical mastoid operation and serum treatment of ozena.

CLEMENT F. THEISEN. Most of Theisen's reports relate to unusual cases, such as: Accessory thyroid tumor at the base of the tongue, lipoma of the tonsil, unusual case of laryngeal syphilis requiring tracheotomy, primary carcinoma of the uvula, some unusual frontal sinus cases, rhinestone in the middle ear of a child. His other papers comprised: Chronic maxillary sinusitis and pneumococcus infections of the nose and throat.

JOHN A. THOMPSON. Early in the history of the association Thompson called attention to the value of tracheal injections. This he repeated a number of times in the course of his activity. His interests were largely in related general conditions as evidenced in his papers on dilatation of the heart, complicating obstructive lesions of the upper air passages, studies in nasal therapeutics, proper fields of medicine and surgery in diseases of the upper air passages and nerve blocking for local anesthesia in tonsillectomy.

MAX THORNER. The first beginnings of autoscropy were brought to the attention of the society by Thorner in his paper on practical experience with autoscropy at the second meeting. At the fourth meeting he presented papers on nasopharyngeal polypus of enormous size and intubation with improved instruments. His great progress was cut short by his untimely death and the association thus lost a great member.

DERRICK T. VAIL. Several important papers were presented by Vail: Herpes zoster auris, removal of the nasal wall of the antrum of Highmore, rhabdomyoma of the nose, orbital abscess and exophthalmos from intranasal suppuration, exoph-

thalmos and third nerve palsy from acute empyema of the posterior ethmoid sinus.

HENRY L. WAGNER. In the earlier days of the association Wagner was a frequent contributor, the field covered being shown by the following: Surgical treatment in caries of the nose and ear, nature of cancer, deformity of both auricles, traumatic dislocation of the left arycartilage, sequestrum of the temporal bone, acute mastoiditis and pharyngitis herpetica ascendens.

ERNEST DEWOLFE WALES. Two very important papers on the acoustic function of the ear were contributed by Wales.

WALTER A. WELLS. The following constitute the titles of the papers contributed by Wells: Septotome, thyroid gland tumor in the larynx, intranasal route in operation upon the nasal accessory sinuses, otitis in an infant four months old, fibrous polyp of the nasopharynx and auditory fatigue.

JOSEPH A. WHITE. Four notable papers came from the pen of White: Laryngeal tuberculosis, mastoiditis complicated by nephritis and erysipelas, cleft palate and laryngoesophageal fistula.

LEON E. WHITE. Leon White, one of the younger Fellows, has made a distinct impression on his subject, the relations of the paranasal sinuses to ocular conditions, by his research work and literary contributions in this field. In addition he has contributed a paper on the bony occlusion of the posterior nares.

GEORGE BACON WOOD. Every study of the pathology of the tonsil must take into account the work done by Wood. His papers on this subject, four in number, all represent most careful investigative work. In addition to this, he has presented papers on tuberculosis of the upper respiratory tract and osteomyelitis of the frontal bone.

THOMAS C. WORTHINGTON. The papers of Worthington comprise the following: Intranasal frontal sinus operation, inflammation of the maxillary sinus, fibroma of the nose, woody phlegmon of the neck.

JONATHAN WRIGHT. One paper has been contributed by Jonathan Wright on the nonmyxomatous character of nasal polypi. Every Fellow in the association will know at once the

value of an article when it is stated that Jonathan Wright is the author.

SIDNEY YANKAUER. Yankauer's papers have all shown the investigative spirit and practical studies. His endoscopic work has made a distinct impression. His contributions embrace: The description of his nasopharyngeal speculum, foreign bodies in the esophagus, foreign bodies in the bronchus, a new direct laryngoscope. Of particular interest is his work on washing out the lung cavities through the aid of bronchoscopy. Besides this work he is responsible for most important papers on the incision for submucous resection, intranasal operations upon the lacrimal apparatus, curetment of the eustachian tube and complete sphenoethmoid operation.

A survey of the foregoing clearly establishes the value of the literature of the society and justifies the pride in which it is held by the Fellows. It is certain that otolaryngology, even medicine itself, is under no little obligation for what the society has done in the various fields of its activity. In announcing the opening of the thirtieth annual congress, I express the hope that you will cherish this record and that you will join hands with those who have been our medical forbears in further advancing the great cause of medicine, which has been our humanitarian portion since we entered upon the practice of our profession.

XXXIII.

MEDICAL REMEDIES FOR THE CONTROL OF
HEMORRHAGE.

BY SAMUEL G. HIGGINS, B. S., M. D.,

MILWAUKEE.

The immediate postoperative concern of the otolaryngologist centers on hemorrhage. Any contribution that may lessen this burden I feel will be accepted. My purpose will be to suggest for your discussion those medical remedies that we have all used, and to contribute my verification of the pharmacologic action of one important official drug that has not as yet been generally used by men of our specialty. The experiences of the various members of this society will add more to clinical information than I could present today by a review of the laboratory findings of each drug. I have found no medical means superseding the fundamentals of exact surgical principles. Surgical technic with regard to the use of ligatures, where indicated, properly applied dressings, and technic in septic areas may not be disregarded in the hope of finding extraordinary aid by known medicinal remedies.

The management of the patient I consider important. This includes the deportment of both the patient and the surgeon. The surgeon should interest himself in the reasonable expectation of the results of the contemplated operation, not the adjustment of an anomaly. The history may contribute much to the knowledge of the pathology of the case. I know of no medical remedies that can be depended upon to control true hemophilia. The assistants and equipment at hand may determine the choice of place for operation—the patient's home, the surgeon's office or the hospital. As a rule, I have not found that patients with postoperative bleeding do as well at home as in the hospital. That the surgeon's control of his patient is more than psychic is shown by less hemorrhage in those patients to whom your instructions were specific. This includes our study of the requirements of each case, and this in turn inspires confidence, obedience and acquiescence.

Your experience will suggest the remedies you have used to avoid excitement and fear. Sedatives may be properly used before and after operations. The bromides or such remedies as sulfonal have a place. Many patients remain quiet and are permitted to remain undisturbed following hypodermic injections of morphin gr. 1/8, hyoscin gr. 1/200, two hours preceding, one hour preceding, and at the time of applying the local anesthetic. The patient's idiosyncrasies to those drugs have an important bearing upon postoperative hemorrhage. Should one always give morphin in event of hemorrhage is a question to be determined by the surgeon.

The choice of anesthetic is influenced greatly by the effect upon bleeding. The increased vascularity of the etherized patient's head usually excludes ether for intranasal surgery. The local action of ether is not the same. I have occasionally directed the anesthetist to drop a few drops of ether in the mastoid wound, which quickly evaporated with some styptic effect. Chloroform produces less cranial congestion. Some of us have seen the sudden pallor and appreciate its dangers. The cyanosis causes us also to forget that it may, in some instances, be legitimately employed. The shrinking effect of cocain, accentuated with adrenalin, is the choice for intranasal surgery. The superficial hyperemia induced by rubbing cocain paste on the septum does not favor a dry operative field. The anesthetic effect may be as efficient by some attempt at block anesthesia. Time and patience permits the use of less cocain and weaker solutions of adrenalin with better hemostatic effect.

If the effect of intranasal dressings or splints is for pressure, the cut areas may be protected by gutta percha or paraffin paper. Petrolatum does not favor coagulation. The effect may be more favorable with the addition of calomel or bismuth subnitrat. Some surgeons prefer narrow strips of gauze impregnated with bismuth powder. (The external application of cold following nose and throat operations may be mentioned in passing.)

At one period in my work I ordered, routinely, hypodermic injection of $\frac{1}{2}$ gr. of emetine following nasal operations. Dr. R. H. Rice of Milwaukee informed me that he prescribes 4 doses a day of potassium iodid, 2 grains, with bichlorid of mer-

cury, gr. 1/30, for patients in whom the pathology suggests a predisposition to bleeding. For some years I gave calcium lactat tablets two days preceding tonsil operations. I have also abandoned the local application of Monsel's solution, tannic acid or tannic and gallic acid following tonsillectomies. Others may report medicinal remedies founded on empiric or laboratory data with experiences that favor their continued use.

Notwithstanding Feinberg's¹ paper on "The Relation of Blood Coagulation to Postoperative Hemorrhage," as deducted from 500 tonsillectomies by various operators, the bleeding time of a person's blood when exposed to his cut tissues, and the coagulation time of his blood may be considered in the scientific study of medicinal remedies for the control of hemorrhage.

Grove and Vines² report the intramuscular (gluteal) injection of 1 grain of calcium chlorid in 100 minims of water of the greatest service in ordinary hemoptysis. Cushing³ states "That the small quantity of calcium absorbed from the alimentary canal has no obvious effects." Walters⁴ reports reduction in coagulation time in cases of jaundice after the oral administration of 100 grains of calcium lactat daily for five days. He prepares patients with obstructive jaundice at the Mayo Clinic for operation by the daily intravenous injections of 5 cubic centimeters of a 10 per cent calcium chlorid solution for a three day period, and observes that in these patients the coagulation of the blood is greatly reduced and the toxicity diminished.

Mills⁵ calls attention to tissue fibrinogen, observing that "Those tissues in which hemorrhage is most dangerous possess the richest stores of tissue fibrinogen—the brain, lungs, kidneys and endothelium of the blood vessels." There exists one apparent contradiction to this view of the clotting process—the liver. This Mills attributes to the nature of the benzene soluble protein, phospholipin, which is a more active coagulant in the lung cells than in the liver.

Joseph B. Greene⁶ has reported the activity of the clotting elements of tonsils made for him by Mills. I can subscribe in part to Dr. Greene's conclusions in that "The application of the tonsil itself to the open vessels of the fossa controls

bleeding more effectually than the usual method of sponging." I wish to resist the temptation of digressing to a consideration of the surgical technic. Suffice it to say, that time is an important element in the coagulation and bleeding process. Possibly the first two minutes of contact of the dissected tonsil to the wound are of greatest value, but I have thought from my efforts that the following three or five minutes were also important. The tissue juices of value are not only the tonsil substance, and the tonsil capsule, but the patient's living tissues in the wound—the blood, the fascia, muscle and endothelium of the severed vessels. My observations would suggest that the mechanical extraction of the tissue juices by the artery forceps in oozing areas in the wound liberates the coagulating substance more effectively. Here, also, the few minutes of time of application are necessary for the various stages of clot formation. Starr⁷ of Toronto refers to the value of torsion. The tonsil wound is handicapped by the fluids of the mouth. Why, then, wash away more tissue juices by encouraging the patient after tonsillectomy to gargle with cold water?

As an acceptance of the action of tissue juices in coagulation, there are on the market several tissue extracts—thromboplastin (Squibb), hemolytic serum (Mulford), hemagulin (Lilly), obtained from calves' brains, coaguline Ciba, coagulose, hemostatic serum (Parke Davis & Co.), obtained from blood platelets, fibrogen (Merrell), obtained from calf lungs, and also the plain horse serum. The laboratory reports given me following the use of both classes of these preparations showed shortened time of bleeding and coagulation. I do not feel that the series was sufficient to draw comparisons, but that clinical observations and laboratory figures indicate some value.

In cases of severe postoperative hemorrhage, my observations of the results of blood transfusion are that its effect is too well known to delay its use as a measure of last resort. The value of transfusion of whole blood is well stated by Peterson⁸: "In acute hemorrhage, whether simple or pathologic, and in chronic posthemorrhage anemia, we have in blood transfusion the best and at times the only efficient remedy. As a tissue transplant to replace lost blood, as a hemostatic agent to check further bleeding, and as a stimulant to the

hematopoetic system to manufacture new blood, the procedure is theoretically and practically sound." The intramuscular injection of untyped blood is an efficient remedy which usually is readily available.

Neuhof⁹ carried out some experiments in 1916, consisting of the intravenous injections of solutions of sodium citrat into dogs under ether anesthesia. The following results are quoted:

"(1) The coagulation time is tremendously shortened a few minutes after the introduction of nontoxic doses of sodium citrat, and this shortened coagulation may be sustained for one or more days. (2) The bleeding time is likewise shortened, so that, after citrat injection, a large vessel can be incised with prompt coagulation about the wound. (3) Coincident with the shortened coagulation time, the color of the venous blood is altered to a light arterial tint. (4) There is no fixed toxic or lethal dose of sodium citrat per kilo of body weight, toxicity depending to a remarkable degree upon the rate of introduction of the citrat solution. (5) A toxic or lethal dose is characterized by a swing from the state of shortened coagulation to one of suspended coagulation. This latter phenomenon led to the sodium citrat method of blood transfusion, and it was this effect which overshadowed the ordinary pharmacologic action of sodium citrat."

Neuhof and Hirshfeld⁹ report a series of 500 cases to whom sodium citrat has been administered, the last 200 being by the intramuscular route, and conclude that such administration results in prompt and pronounced shortening of coagulation and bleeding time, which is of two or three hours' duration, with a gradual return to normal within twenty-four to forty-eight hours. They established the optimum dose as 30 c. c. of a 30 per cent solution, and the intramuscular route as the one of choice.

Following the work reported by Neuhof and Hirshfeld,⁹ in 1922, Dr. David Fisher and I have injected intramuscularly sodium citrat for the control (mostly prophylactic) of hemorrhage in over fifty patients in the Soldiers' Home Hospital in Milwaukee.

The coagulation time of the first twenty-five of this series is tabulated in the report¹⁰ of our work, published in the August, 1924, number of the *Annals of Surgery*. Over twenty-

five more injections have been carried out by my associate in the Soldiers' Home Hospital, Dr. Eugene Dallwig, which, with injections given by me in private patients, runs the series over one hundred. No untoward results, other than temporary local tenderness, were observed following any of the injections. In one case there was considerable infiltration but no fluctuation; we ascribed this to a hematoma.

BLOOD COAGULATION FOLLOWING THE INTRAMUSCULAR INJECTION OF SODIUM CITRAT*

Case Number	1	2	3	4	5
Coagulated time before injection	11 min.	9 min. 8	min. 6	min. 9	min.
10 minutes following injection	9 min.	9 min. 7	min. 6	min. 8	min.
20 minutes following injection	7 min.	7 min. 7	min. 4	min. 6	min.
30 minutes following injection	4 min.	5 min. 4	min. 2	min. 4	min.
45 minutes following injection	2 min.	2 min. 1½	min. 1	min. 2½	min.
60 minutes following injection	3 min.	2 min. 3	min. 3	min. 3	min.
6 hours following injection	6 min.	3 min. 3	min. 3	min. 4	min.
12 hours following injection	7 min.	5 min. 5	min. 4	min. 4	min.
18 hours following injection	9 min.	6 min. 5	min. 4½	min. 5	min.
24 hours following injection	9 min.	6 min. 7	min. 5	min. 7	min.
36 hours following injection	10 min.	9 min. 8	min. 5	min. 9	min.
48 hours following injection	10 min.	9 min. 8	min. 5	min. 9	min.

This chart is a copy taken from Dr. Higgins' paper in the *Annals of Surgery*, August, 1924.

The chart of the first five cases of the series is typical of the drop in coagulation time of all the cases. Normal coagulation time of 3½ minutes is also shortened to coagulation time of 2 to 1½ minutes. In view of one septum patient who had some bleeding, and who was injected during the course of the operation, and the pleasing result of the other patients injected before operation, it is my opinion that sodium citrat is more effective when administered before operation. If morphin or another narcotic is employed before operation, the citrat can be conveniently injected at that time. That it is of some value when used during an operation is attested by its administration during the course of a radical mastoid operation in a case of unusual, though not serious, oozing from the mastoid bone. In this instance there was less sponging required than is usual when completing the operation, some thirty minutes later, in the attic and middle ear.

The coagulation time of the first patient was eleven minutes on admission; ten minutes following the injection, the coagu-

lation time dropped to nine minutes; twenty minutes after injection, the time was down to seven minutes; thirty minutes after injection, the time was down to four minutes; forty-five minutes following injection the lowest point was reached, in this case being two minutes. From then on there was a return to normal, but more gradual than the abrupt fall. One hour after injection the coagulation time in this case was three minutes; six hours after injection, it was six minutes; twelve hours after injection, it was seven minutes; eighteen hours after injection, it was nine minutes; and so on until the coagulation time previous to the injection was reached. The field was drier following tonsillectomy in this case than the usual noncitratated case with normal coagulation time. This same patient was operated seven days later for deviated septum. His coagulation time then was nine minutes. If necessary the dose can be repeated in thirty-six hours, thereby controlling the coagulation time for a longer period. The majority of my cases were patients on whom nose and throat operations were performed, and the results were highly gratifying. The field of operation in tonsillectomy patients previously citratated was dry and remained so; sutures were rarely necessary.

TECHNIC OF THE INTRAMUSCULAR INJECTIONS.

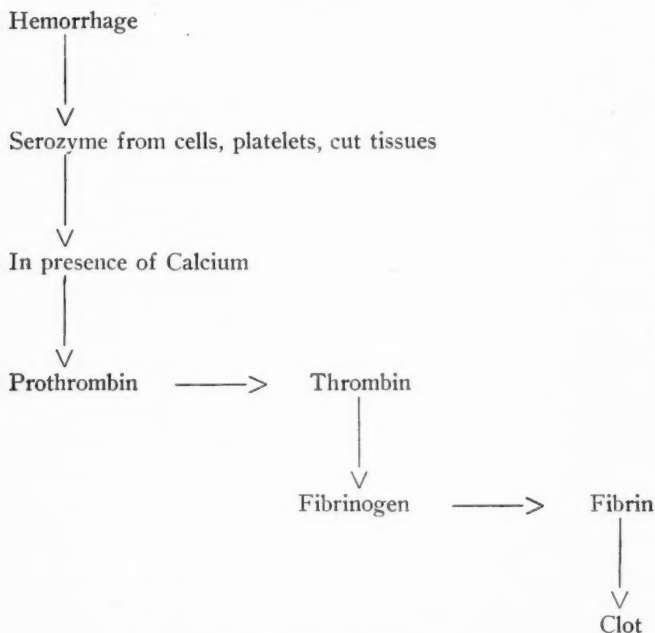
The solution used is sodium citrat, C. P., 30 per cent, sterilized by boiling. The dose given is 30 c. c., and the site of injection is the buttocks. The skin over each buttock is cleansed with alcohol, dried, and tincture of iodine applied over a broad area. With a three inch needle 3 c. c. of a 1 per cent novocain solution is injected into each buttock. Three minutes are allowed to elapse, and then 15 c. c. of the citrat solution are injected into each buttock, directly in the same area as in the injection of novocain. The novocain tends to diminish to a great degree the pain, which is temporary only. Where time is an important factor, or where the condition of the patient is such that he cannot be moved, the entire 30 c. c. may be given in one buttock. I have injected 30 c. c. in one buttock on five different occasions in the case of mastoiditis, and in four tonsillectomies following peritonsillar abscess. Tenderness was noticed in a few instances, but this was relieved even in the sitting position by a soft pillow or rubber ring. I also used

citrat intramuscularly in consultation in a severe case of post-operative hemorrhage, in which horse serum and similar agents were administered before the citrat injection.

INTRAVENOUS INJECTIONS.

Neuhof and Hirschfeld⁹ indicated that toxicity depends upon the rate of introduction of the citrat solution. The intramuscular route seemed to be the one of choice for slow absorption and optimum dosage. From a personal use of sodium citrat intramuscularly in 100 cases, I feel that its application in this manner is safe and efficient. The recent work of Rosenthal and Baehr¹¹ indicates that sodium citrat may be safely administered intravenously. They state that if properly administered, from 3 to 6 grains can be safely given to an adult of average size. The citrat should be well diluted, and the procedure should take at least fifteen minutes continuously, not intermittently, during that period, to avoid too great a concentration in the heart's blood at any one time. They report that they have repeatedly employed this means of arresting secondary hemorrhages in a variety of medical conditions, such as gastric ulcer, pulmonary tuberculosis, cerebral hemorrhage, typhoid fever, and after tonsillectomy. From 3 to 6 c. c. of a 30 per cent solution of sodium citrat (3 to 6 gm.) has usually been administered, very slowly, the intravenous injection taking from ten to fifteen minutes for completion. In concluding their paper, Rosenthal and Baehr advise, "For absolute safety the administration of sodium citrat in from 200 to 500 c. c. of blood in the form of the citrat transfusion of Lewisohn."

OUTLINE SKETCH OF THE THEORY OF THE COAGULATION OF
THE BLOOD.



NATURE OF THE REACTIONS.

Rosenthal and Baehr's extensive experiments show that:

1. Sodium citrat does not destroy the blood platelets in the test tube, but rather it preserves them, so that they may be more readily counted.
2. Within a few minutes following the intravenous injection of sodium citrat, the blood platelets diminish in number; the maximum decrease is usually within ten to fifteen minutes, with return to normal number in one-half to one hour.
3. Free thromboplastin substance (cytozyme, serozyme) appears in the blood as the coagulation time is shortened.

4. No demonstrable changes in the blood were obtainable in regard to the other factors in coagulation, calcium, fibrinogen or antithrombin.

5. Shortened coagulation time and increase in the thromboplastic agent follows the reduction in number of blood platelets.

6. Coagulation time is not shortened by the intravenous injection of sodium citrat in animals (ducks) which are devoid of blood platelets; the coagulation time was in one case greatly prolonged.

7. Coagulation time is prolonged following the introduction of sodium citrat in human beings in the presence of diseases deficient in blood platelets, numerically or qualitatively, e. g., purpura hemorrhagica and congenital hemophilia, or pernicious anemia, or Bantés disease. They conclude that the action of sodium citrat is upon the blood platelets not by direct destruction, but that the blood platelets are damaged, and then removed from the circulation by some organ, probably the spleen, there destroyed, and their thromboplastic substance liberated into the blood stream.

Renaud and Juge,¹² in Paris, report the observation of 14 cases, in which the injection of solutions of sodium citrat has been followed by an immediate and abrupt cessation of profuse hemorrhage, which had resisted all other therapeutic measures. After injecting 10 to 25 c. c. of a 30 per cent solution of sodium citrat, freshly prepared, they have witnessed in the great majority of cases (14 out of 17) an almost immediate cessation of hemorrhage, such as occurs in cancer and tuberculosis. They observed a reaction following the intravenous injection of sodium citrat—the symptoms were anxiety, malaise, increased pulse rate with a fall in pulse tension and nausea. Dr. Dallwig injected intravenously in one patient 200 c. c. of a 3 per cent solution. The patient complained of fleeting symptoms during the injection only, of tingling sensations in the extremities, nausea and slight faintness. Possibly the symptoms of a reaction may be avoided by prolonging the time of administering the injection.

CONCLUSIONS.

1. Many medicinal remedies have value in the control of hemorrhage.

2. The value of sodium citrat is clinically and theoretically proven.

3. More general use of sodium citrat will establish proficiency and refinements in the administration.

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XXXIV.

THE COMPARATIVE VALUE OF TRANSILLUMINATION AND ROENTGENOGRAPHY IN DIAGNOSIS OF MAXILLARY SINUS DISEASE— AUTHOR'S METHODS.*

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ANATOMY.

The maxillary sinus is the most constant of all the nasal accessory sinuses. Rechreiter in an exhaustive research found it absent only four times. Its regularity in size is attested in a most valuable contribution to anatomy by Davis (Davis, W. B.: "Anatomy of the Nasal Accessory Sinuses," ANNALS OF OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY, 27:940, Sept., 1918), from which the following mensuration and relationship are taken:

Average dimensions of antrum, 100 necropsies.

	Age: 8 days	1 yr.	10 yrs.	20 yrs.
Vertical	3.3	5.7	21.0	26.5
Lateral	2.8	4.6	18.0	20.0
Anteroposterior	8.2	13.3	37.5	32.0
Relation of antral floor		4.3	0.2	1 to 7.5
to nasal floor		above	above	below

In early infancy the antrum is ovoid, later becoming pyramidal, the latter being more accentuated as adolescence is approached. At first its floor is above the nasal floor, descending continually with age, when at eight they are on the same level, and in adolescence are from 1 to 7½ mm. below the nasal floor.

The base is the nasal wall, quadrilateral in shape, becoming triangular at the apex near the processus zygomaticus. The anterior and posterior walls are narrower below than above.

*Read before the Eastern Section of the American Laryngological, Rhinological and Otological Society, New Haven, Conn., January 7, 1924.

forming rounded angles. The external wall is triangular with base at the external apical portion of the molar and premolar portions of the alveolar process and apex at the zygomaticus. The orbital wall is the triangular floor of the orbit. The floor is formed by the alveolar process, represented by the molars and premolars, and by that part of the hard palate extending immediately inward. It also extends externally outward and upward towards the buccal cavity to join the external wall. The floor is over the molars and the posterior part of the second premolar. The canine is never found below the antrum, but its posterior border may be immediately in front of it.

OPINIONS AT VARIANCE.

It is quite interesting to note how various observers differ as to the value of transillumination and the X-ray in diagnosis of maxillary sinus disease. Watson-Williams (*Journal of Laryngology*, London, 1922, XXXVII, p. 227-229), discussing "The Diagnostic Value of Transillumination of the Maxillary Sinus," reporting 259 checked cases of antral disease treated in the British Royal Infirmary from 1909 to 1917, concluded that "unequal illumination of the two antra proved that the one showing the shadow was infected in five out of six cases." He found "20 per cent error based on macroscopic findings, 34 per cent based on cultures and microscopic findings, and in cases showing no nasal discharge more than half were not detected by transillumination." He states that transillumination was discontinued in 1917, presumably because it was unreliable.

Dutrow (*Laryngoscope*, 1921, XXXI, p. 296-301), discussing "Diagnosis and Treatment of Sinus Disease," considers the X-ray consistent with clinical findings, that it is essentially a positive, and transillumination a negative test, and that the X-ray is more sensitive to the diseased mucous membranes than is transillumination.

Atkinson (*American Physician*, 1922, XVII, p. 27-29), in speaking of the difficulties of diagnosing empyema of the maxillary sinus considers transillumination a reliable aid and that the X-ray is by no means a diagnostic certainty.

Looper (*Journal of the American Medical Association*, Vol. LXIX, No. 10) considers transillumination unreliable in chil-

dren and misleading. He quotes Skillern that the X-ray is our greatest aid, but must be made by a skilled roentgenologist.

Lemere (American Laryngological, Rhinological and Otological Society, 1920, XXIX, p. 88) states that both the X-ray and transillumination may show negative in an infected antrum not formerly suspected, that transillumination often fails because the secretion is of a glairy, translucent consistency, but will show a definite shadow with the X-ray.

Levy (Transactions American Laryngological, Rhinological and Otological Society, 1920, p. 494), states: "In some cases of actual disease of nasal accessory sinuses there is no discharge whatever, but on resorting to X-ray examination shadows appear which may be more or less confirmatory of the condition to which the location of the pain points"; that "so much depends on the technic and interpretation that even X-ray experts differ as to its possibilities in diagnosis." Again, "when local symptoms are absent, positive skiagrams undoubtedly indicate some pathology, but what the pathology is, or how important, is another matter." Again, "many surprises are in store for us if we expect to find pus every time the X-ray says we will, but positive X-ray findings do offer moral support for operation in obscure cases."

Shambaugh (Editor's footnote, Practical Medical Series, 1923, Eye, Ear, Nose and Throat, p. 368) says: "In the case of the maxillary sinus very little is added by the X-ray that is not shown by transillumination, and the irrigation of the sinus, so simple to carry out, gives more information than either."

Law (American Journal of Roentgenology and Radium Therapy, April, 1923, Vol. V, No. 4) in an article "Errors of X-ray Interpretation in Lesions of the Sinuses," in explaining negative clinical findings after positive roentgenograms, says: "The reason is that in the interval between the (X-ray) examination of the patient and his presence in your office he blows his nose, completely draining both the ethmoids and the antra." He states, further, that "if you get an opaque antrum and it is punctured and found clear, and you make another (X-ray) examination and still find an opaque antrum, you can be absolutely assured that the antrum is full of polypoid tissue."

An apology may be in order for presenting to a society of rhinologists, many of whom might more properly deserve the title of sinuologists, the subject, apparently threadbare, of transillumination of the maxillary sinus. Conviction of the importance of the subject, and especially of the value of a method devised by the esayist and used for fifteen years with the greatest satisfaction, has prompted me to offer my experience with the hope that you may be convinced that transillumination is an invaluable aid and should be a part of the routine in every rhinologic examination. It is not claimed that it should replace the X-ray, except in certain types of cases where its use may render the latter unnecessary, a point deserving of appreciation in clinics, and where the patient's finances are limited. The quickness of the test, moreover, should be appreciated by the busy clinician.

AUTHOR'S METHOD OF TRANSILLUMINATION.

The patient is seated on a high stool in a dark room, requested to tilt the head backward, open the mouth, close the lids and direct the eyes downward. A really dark room is necessary for reliable information with any method of transillumination. The high stool and the head tilted backward are to bring the hard palate and the region of the molars into comfortable view, and the tongue depressor retracting the cheek allows a view, not only of the hard palate and the molars, but of the buccal cavity outside and above the molars, the floor of the antrum lying above these structures.

The light, an ordinary 6-volt lamp, controlled by a graduated rheostat in order to note the minimum voltage required for translucency, is placed on a shank having two 45° angles, for the purpose of directing the light downward. The lamp is so constructed as to avoid escape of light against the patient's face, and is placed against the lower eyelid, directly below the pupil, pressed backward beyond the infraorbital ridge and directed downward toward the floor of the antrum. If not obstructed, the light will illuminate the floor of the antrum and can be observed as a pink area on that part of the roof of the mouth near the molars and the buccal wall above the alveolar process.

The advantages of this method of transillumination over that of the Heryng, or old, method, are, first, that the light passes

through less extraneous (to the sinus) tissue; second, it passes through opposite instead of adjacent antral walls and therefore penetrates deeper into the cavity; third, the exit of light is through the floor of the cavity, where pathologic conditions are most often present, and where the interference to the light will be most recognized; fourth, it takes less time; and fifth, is more cleanly.

ROENTGENOGRAM: POSITION.

Of the many conditions necessary to making a good roentgenogram, one of the most important is that the part to be rayed should be as near the plate and as nearly in focus as possible, but, above all, that no confusing shadows of unnecessary parts nearer the tube be superimposed. In roentgenography of the nasal accessory sinuses the parts thus to be avoided lie at the base of the cranial fossa. The one offering the less opacity and projected highest on the plate is that of the greater wings of the sphenoid, whose shadows in most positions lie across the orbit. They present narrow shadows curved upward and outward, are only slightly obstructive, and are easily recognized. The petrous portions of the temporals, however, show broad, dense shadows projected entirely across the field from mastoid to mastoid. They represent the densest bone in the head and cast the greatest shadows to be found on the plate except that of the teeth and alveolar processes. In order, therefore, to avoid these obstructions the essayist has adopted and used for years a practical method of placing the head, plate and angle of the central rays so that the shadow of the petrous bone falls entirely below that of the antrum, and that of the sphenoid wings above the antrum across the orbit. These obstructions above mentioned represent the boundary of the middle fossa, the sphenoid, in front and above, and the petrous behind and below. The aim should be, therefore, to so direct the central rays that they may pass over the petrous portion of the temple, through the middle fossa and below the greater wing of the sphenoid, at the same time being directed toward the center of the horizontal line connecting the centers of the two antra.

A plane passed through the external auditory canals and through the upper incisor teeth will pass along the upper mar-

gins of the petrous bones and the lower border of the antra. If the central rays, therefore, be directed just above this plane it will pass through the center of the antrum and far enough above the petrous bone to be unobstructed by the latter. With this relationship of the central rays and head borne in mind, it matters little whether one uses the chin-nose or the nose-forehead position of plate. The chin-nose position has the advantage of bringing the antrum nearer the plate, makes a less acute angle with the central rays and, therefore, insures less distortion. It has been the essayist's choice of positions for the past ten years, and the one used in most of the plates soon to be shown on the screen.

It is my opinion that both roentgenography and transillumination are of the greatest value in diagnosing sinus pathology, especially in maxillary and frontal sinus disease. The X-ray is superior to transillumination in outlining the anatomic relations, showing foreign bodies, as unerupted teeth, and perhaps in detailing shadows of chronic thickening of mucous membrane and bony walls. Transillumination in the essayist's hands is more reliable in acute infections and is more sensitive to the retained antral secretions. The quickness, facility and inexpensiveness of the test add considerably to its value. Were I limited to the use of only one of these exceedingly valuable adjuncts to our armamentarium, I should choose transillumination.

Modern medicine attributes to focal infection an important rôle, and infection of the maxillary sinuses is of far more frequent occurrence than was formerly suspected. Anything, therefore, that will assist in determining sinus infection should be welcomed, not only by the internist, but especially by the rhinologist, on whom the practitioner and patient must depend for diagnosis and treatment.

TONSILLECTOMY AND ADENOIDECTOMY IN SELECTED CASES DURING THE PERIODS OF PRIMARY AND SECONDARY INFECTIONS—A RATIONAL AND CONSERVATIVE PROCEDURE—REPORT OF CASES.

By FREDERICK T. CLARK, M. D., F. A. C. S.,

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At the outset, in order to forestall any misapprehension, and although indicated in the title of this paper, the writer wishes to state he does not advocate indiscriminate tonsilloadenoidectomy. He believes a careful examination of each patient should precede the selection of all cases submitted to operation.

This discussion includes all tonsillectomies and tonsilloadenoidectomies done under local or general anesthesia—

(1) When tonsils or adenoids are acutely inflamed or infected, as during any kind of an angina, or

(2) When the operation is done during the course of one of the acute contagious diseases, or

(3) When the operation is done during the course of some secondary infection, as during an acute otitis or mastoiditis, bronchitis, nephritis, endocarditis, neuritis, rheumatism or any other secondary infection that may be due to infected tonsils or adenoids as the primary focus of infection.

No claim is made for the originality of the matter here presented. It is believed, however, that the discussion will serve to focus attention on the importance of tonsilloadenoidectomy in the condition mentioned, and states the belief that what is now looked on askance by many practitioners as a rash and radical procedure will, at no distant day, be regarded as rational and conservative—yes, even life saving—surgery.

During the past few years there have been numerous references in the literature to the removal of tonsils and of tonsils and adenoids during the period of acute infections. Until recently, to have advocated tonsillectomy and adenoidectomy

during the period of acute infections for relief of any but emergency conditions would have been received as a therapeutic heresy. At the 1923 session of this Academy in Washington, we were told that this organization is the largest and most representative body in the world of specialists in any department of medicine and surgery. At that session two papers were read and very generally discussed, in which the essayists, Thomas¹ and Wolfe,² urged, when indicated, the removal of tonsils and adenoids when acutely infected. Porter³ has recently reported a number of cases operated on during the periods of acute infection. He concludes there are two general types of peritonsillar abscess: the common supratonsillar type and the basilar. He states that any treatment or operative procedure other than enucleation in the latter type is dangerous to the life of the patient. He believes, too, that marked glandular swelling following acute tonsillitis in children is a strong indication for prompt enucleation, and Porter predicts, without qualifications, that it will ultimately be considered proper surgical procedure to remove tonsils during acute attacks.

Thomas and Wolfe in Washington urged, when indicated, the removal of tonsils and adenoids when acutely infected. Tonsilloadenoidectomy was urged by Thomas in selected cases as one of a series of steps in the management of acute otitis media and prevention of the acute mastoid operation. Thomas states he has many times removed tonsils and adenoids in adults when they were in a state of severe acute inflammation and has had no cause to regret the operation. Such patients recover much more promptly following operation than when left for the acute inflammatory process to subside before operating, when a period of from one to three weeks or even longer may be required, during which time the patient is absorbing toxins.

Wolfe, in his paper before the Academy, on the prevention of surgical mastoiditis, comes out flatly and says the prompt removal of tonsils and adenoids, together with free incision of the ear drum, is his first consideration in acute catarrhal otitis media (earache) and will often prevent acute purulent otitis and mastoiditis from developing. Dean⁴ and others have called attention to the almost constant presence of infected tonsils and adenoids in children with sinusitis. Wolfe says that probably 95 to 98 per cent of all cases of acute purulent otitis

occurring in children can be directly or indirectly attributed to infected tonsils and adenoids.

I wonder if we have a sufficient realization of the importance of Chadwick's⁵ recent contribution to medical knowledge? Has it penetrated our consciousness that his conception of juvenile tuberculosis begins a new epoch in the handling of the white plague, and will save multitudes of lives that would otherwise be offered up on the altar of ignorance? Do we appreciate the fact that the Westfield Sanatorium has become a Mecca to which internists, pediatricians and roentgenologists alike, interested in this new conception of juvenile tuberculosis, are coming for instruction? Chadwick's conception of the juvenile type of the disease points to the tonsils and adenoids as among the portals of entry for the tubercle bacilli which eventually invade the bronchial glands. In cases of this type our first consideration should be to determine, by means of the tuberculin test, whether we have to deal with a tubercular or other form of infection. In either case, competent advice should be sought as to an immediate tonsillo-adenoidectomy.

That infected tonsils and adenoids in children are responsible for a large percentage of the cases of bronchitis and bronchopneumonia has become to pediatricians and otolaryngologists a commonplace. This fact, however, does not seem to be well recognized by the family physician. In the writer's experience, many children, even of physicians themselves, who are subject to bronchial irritation, coughs and colds, are treated without recognition of or recommendation of removal of the primary infection in the throats of these little patients.

So far as I have learned, Glogau⁶ of New York City, in 1920, was among the first well known otolaryngologists to urge the immediate radical removal of infected tonsils and adenoids as of prime importance in impending or present acute purulent otitis and beginning mastoiditis. The bitter criticisms of Glogau's contentions are matters of record. After an observation extending over many years, during which the writer practiced these procedures in many cases where it was possible to gain the consent of the parents and family physician, he has no hesitancy in aligning himself with the men who have taken this advanced position. With Glogau, he believes the mastoid

operation before long will become a comparatively rare occurrence, because, due to appropriate procedures and prophylaxis, it will be necessary only in exceptional cases.

The writer goes still farther and believes the time is not far distant when the tremendous conservatism which has heretofore looked askance at any operative procedures in acute contagious diseases will give way to a more rational and favorable attitude toward tonsillectomy and adenoidectomy in these conditions.

In 1922, Place⁷ of Boston pointed out the importance of the tonsils (and adenoids) as points of attack and portals of entry in scarlet fever and diphtheria. It is well known that throat symptoms in scarlet fever occurring in tonsillectomized patients are almost invariably slight, even to the point of absence. Severe faucial diphtheria is excessively rare in tonsillectomized patients, and when it does occur in such cases it is posterior to the posterior pillars. The writer wishes to point out the rarity, in his experience, of measles, in all but its mildest types, in patients who have had their tonsils and adenoids removed.

The studies of Dochez⁸ concerning the significance of the streptococcus hemolyticus in scarlet fever indicates that this organism found in the throats of scarlet fever patients may be a specific type readily distinguishable by agglutination and other immunologic tests from types of streptococcus hemolyticus causing other forms of angina and general septic conditions. This apparently specific type of organism was present in all of a large series of cases of scarlatina. Dick and Dick⁹ of the John McCormick Institution for Infectious Diseases in Chicago, after many years of research work in this field, have strengthened the evidence in favor of a specific strain of the hemolytic streptococcus as the cause of scarlatina. They have made extensive studies looking toward the development of an antitoxic serum. Their work has been confirmed by Zingher¹⁰ and Branch and Edwards¹¹ working independently, and it is confidently expected that the time is near at hand when the susceptibility of individuals to scarlet fever will be generally recognized by a procedure similar to the Schick test in diphtheria, and, when susceptible, they will be rendered immune as is done today by toxin antitoxin in diphtheria.

In view of the inference, then, that the tonsils and adenoids are the chief foci of infection in scarlet fever, diphtheria and measles, it is only logical that tonsilloadenoidectomy be practiced not only as a prophylactic measure but as a rational means of shortening contagion during acute attacks, in selected cases, and to prevent the frequent otitic and nephritic sequelæ. Taken in conjunction with the administration of Dochez's antiscarlatina serum, as reported by Blake,¹² the outlook for the prevention of scarlet fever, and for its cure when developed, seems bright indeed. There is no doubt that a much more favorable attitude toward tonsilloadenoidectomy in the acute infectious diseases has been developed in the past few years. Not only as a prophylactic measure is it becoming a recognized procedure, but operation is now being urged by many pediatricists during the active stages of the acute contagious diseases. Place reports 122 cases of scarlet fever operated on during the active stages of the disease. Many of these cases were operated on because of the continuation of the contagiousness of the patients, and because complications were threatening before operative intervention was considered. Of this series he reports 73.7 per cent recovering with the development of no complication. When we think of the frequency of albuminuria and purulent otitis as sequelæ of scarlatina the significance of this report is worthy of our earnest consideration. His operative cases varied from six months to twenty-five years. During diphtheria, in diphtheria carriers, septic sore throat, tonsillitis (chiefly to cut short an acute arthritis or rheumatoid attack) and in chorea, tonsillectomy was performed 74 times. Place comes out strongly and says tonsilloadenoidectomy is a valuable means of shortening the contagiousness of scarlet fever and diphtheria in suitable cases; that there is reason to believe early operation in scarlet fever tends to reduce the danger of complications; that operative dangers are not great, and local infection is less common than in nonoperative cases.

The writer is of the impression that the average practitioner has a clear conception of infected tonsils and adenoids as among the chief portals of entry and foci of rheumatic infections. Starling¹³ points out that the presence of enlarged lymphatic glands under the jaw is a more constant proof of ton-

sillar infection than the appearance of the tonsils. Tonsillar infection not only initiates the onset of rheumatic conditions but may directly prolong an acute attack and be the cause of repeated subsequent attacks. He urges the removal of the tonsils, at once, to end an acute attack and prevent further infection, and stresses the importance of removing every particle of tonsillar tissue. A mere tag or stump left behind may be as potent a source of infection as were the whole tonsils before operation. In the course of rheumatic infection the earlier the tonsils are removed the greater the benefit derived. The benefits are manifested not only in the acquisition of a healthy color and an increase in weight and efficiency but also in the prevention of further infection of the endocardium and an apparent mitigation of the damage already suffered by it. The operation also removes an infective focus, the toxin from which is prejudicial to the heart muscle as well as to the whole system.

Only a little more than a year ago Cautley¹⁴ indicated that it is not widely recognized that infection of the tonsils in little children and adults is frequently the explanation of an attack of hematuria, albuminuria and acute nephritis, which may become chronic, and that tonsilloadenoidectomy is a necessary procedure that to be life saving must be done before structural changes in the kidneys have developed. At present it is a moot question whether the enucleation should be done at once or wait until the local infection or hematuria has subsided. In severe cases, or those tending toward chronicity, we should have no hesitation in urging immediate operation.

Only a little more than a year ago Smith and Bailey,¹⁵ in the *Archives of Pediatrics*, reported several cases to demonstrate the close relationship between infected tonsils and infected kidneys, and also to show the result obtained by removal of the tonsils in the acute stages of nephritis or pyelonephritis. These authors say: "As the tonsils (and adenoids) are perhaps the most common avenue of infection it is logical, in a seemingly primary acute nephritis or pyelonephritis, first to suspect that the tonsils are responsible for the entrance of the infecting organism. If the tonsils are found chronically infected (culture) and no other focus is discoverable, the tonsils (and adenoids) should be immediately removed, even in

the acute stage of the kidney disorder, to prevent permanent structural changes in the kidneys."

It is well recognized by ophthalmologists that obscure inflammations of the eye are most frequently the result of a focal infection. Bell¹⁶ of New York has brought prominently to our minds the relations of teeth, tonsils and intestinal toxemias to diseases of the eye. He speaks of "the ramifications of the three T's (teeth, tonsils and toxemias of the intestinal tract)" as being so closely identified in his mind, as etiologic factors, that in thinking of any one of the "three T's" in connection with obscure eye diseases the other two are invariably brought to mind.

Before summing up the conclusions that are to be logically formulated from this discussion, the following brief reports of typical cases are included. The writer regrets he is unable to report cases that are representative of each type of primary and secondary infection previously referred to. He believes, however, that this inability does not materially detract from the logic of the opinions herein expressed.

Case 2183.—Mr. S. G. A., 38, referred May 8, 1924, by Dr. J. B. Atwater. Patient in bed. For weeks had been having intermittent attacks of sore throat, mostly on right side, and has at intervals coughed and raised bloody sputum. Five days previously developed severe sore throat of right side. Had taken but little food and painful swallowing was apparent. Voice muffled. Glands under right side of jaw much swollen. Right tonsil patched, swollen, soft and spongy. Right tonsillar region very tender. Definite fluctuation could not be made out. Left side of throat was not involved. Patient was coughing and raising much pus, which could be readily seen on posterior pharyngeal wall. This patient had served actively four years under great strain in the British aviation service. His plane crashed, and after nine months of hospitalization he returned to civil life with nerves badly shattered. His tonsils had been operated on prior to his entry into the army. He dressed, was driven to my office where, under local anesthesia, the right tonsil was enucleated. It was a large, flat, spongy, submerged tonsil, and its enucleation exposed an abscess cavity between the base of the tonsil and the musculature forming the tonsillar fossa. He was returned home and to bed. He

made an uninterrupted recovery and in two weeks appeared at my office for the removal of the left tonsil. This patient, during convalescence from the first tonsillectomy, was referred to Dr. Chadwick for examination of his lungs. Pulmonary abscess had been suspected by Dr. Atwater, and I believe the physical signs and X-ray plates, while not positive, pointed to that diagnosis as the cause of his cough and expectoration. At any rate, he has made a complete recovery and reports he has not felt as well since his entry into military service.

Case 2235.—Ralph S. W., 24, referred by Dr. G. H. Janes, June 24, 1924. Four days before, he woke up with stiff neck and sore throat that as the day wore on became more painful. Two days later he saw his local physician, who painted his throat. The next morning his throat was no better. The glands under the angle of his right jaw were swollen and tender, and the area below the ear and over the sternocleidomastoid muscle swollen. Right ear felt stuffy. The right tonsillar region was swollen, the pillars of the right side edematous and the tonsillar follicles grayish. The tonsil was very tender on pressure and dysphagia a prominent symptom. There was no swelling of the left side, but the tonsil was patched and submerged. Temperature, 99.2° F., pulse 84. Under local anesthesia I did an immediate tonsillectomy, exposing a small abscess containing a few drops of thick, foul smelling pus. The abscess was between the base of the tonsil and the musculature of the tonsillar fossa. The temperature and pulse the next morning were normal. The cervical swelling had disappeared, and the glandular tenderness was much less noticeable. He made an uninterrupted recovery, and one week later drove his car to his home, a distance of twenty miles.

Case 715.—Helen A. H., 4. Referred by Dr. A. J. Logie, May 28, 1922. In March this little girl was ill with influenza. Her father stated she had been miserable ever since. About ten days prior to my seeing her she developed earache with discharge from both ears. Her father was urged by her local physician to take her to the hospital in Pittsfield for double mastoid operation. She was then seen by Dr. Logie, who referred her to me. On examination right mastoid tender on pressure, but not swollen, red or edematous. There was pus

in the canal, which was swollen, and a pouting perforation in the roof of the canal was seen near the drum. The left mastoid was tender but not swollen, red or edematous. There was pus in the canal and a perforation of the drum could be seen. Temperature was $103^{\circ} + F.$, and pulse 130. She was emaciated and septic. She was sent to the hospital, and immediately under ether by Dr. Schoonmaker, both drums were freely incised and tonsilloadenoidectomy done. In four days' time all tenderness of mastoids had disappeared. She made a slow but uninterrupted recovery. Due to her sepsis, it was three weeks from the date of her operation before she kept a normal evening temperature and on the twenty-sixth day both ears were dry and the next day she went home.

Case 2219.—Jessie E. S., 13, referred by Dr. M. D. Chisholm June 16, 1924. Gives history of having frequent attacks of tonsillitis. Glands under jaw palpable. Four days ago, without apparent cold in head, developed left earache which continued, with development of pain the head back of the ear. On examination the left canal is swollen and the drum is red. The mastoid is very tender on pressure over the antrum. Tonsils hypertrophied. Temperature $99.4^{\circ} F.$ Pulse 100. She was sent to the hospital and immediately under ether by Dr. Chisholm free incision of the drum was made and a thorough tonsilloadenoidectomy done. A profuse serosanguinous fluid welled out of the ear on incision of the drum. The next day the mastoid tenderness had disappeared and she returned home the following day. She made a speedy, uninterrupted recovery.

Case 2256.—C. M., male, 14 months, referred by Dr. W. L. Connery July 16, 1924. Mother states the child has been crying at intervals for the past ten days with earache. She says he has had a cold (snuffles) ever since he was born. He grew rapidly till eight months old and has not gained an ounce in the past six months. Is feverish and fretful at night and sleeps much of the day. Temperature at 3 p. m., when examined, $101.6^{\circ} F.$ Glands under angle of jaw swollen and tender. Both ear drums dusky and lack luster. Tonsils patched and mass of adenoids palpated. Under ether by Dr. Connery immediate tonsilloadenoidectomy was done. Went home next morning, and forty-eight hours later the child's temperature

was normal and he slept all night. He has made a complete recovery and is rapidly gaining weight.

Case 1576.—Marion C. T., 4, referred by Dr. J. B. Atwater June 15, 1918, for removal of tonsils and adenoids. This advice was not immediately followed. Four days later she developed left ethmoiditis with swelling and edema of the left eye and proptosis. Right side not affected. The nose was full of mucopus (snuffles). Temperature, $101^{\circ}+$, pulse $140+$. The parents would not consent to operation which would, I believe, have saved this little girl much suffering and illness. Under the use of nasal irrigations, argyrol instillations in nose and hot compresses to the eye, the swelling finally entirely subsided without development of an orbital abscess. The treatment was kept up pretty continuously throughout the summer, until when seen again, September 15th, the swelling had entirely disappeared. There was, however, a profuse purulent discharge from the nose, indicative of the involvement of the ethmoids. The next day tonsilloadenoidectomy was done. The writer at this time entered the army and did not see the child again for more than two years. She had been very much better in the two preceding years since the tonsilloadenoidectomy. However, she gave the history of frequent colds and of persistent cough during the period of these coryzas. For several days, beginning with a cold in the head, she had coughed persistently, keeping the household awake and dancing attendance. Examination of right nostril was negative. The left middle turbinate was swollen and in contact with the septum. Transillumination showed marked shadow of the left antrum. Larynx was negative. The child had a left purulent ethmoiditis and maxillary sinusitis. Immediate operation was advised and declined. The writer did not see the patient again for more than three years, December 11, 1923, when she was referred by Dr. Chadwick. She had developed profuse purulent discharge from the right as well as the left nostril and had a violent and almost continuous cough. She had been under treatment in a neighboring city with negative results, and had been finally taken to Dr. Chadwick to determine if the cough was of tubercular origin. The tuberculin test was negative, but the X-ray showed very large bronchial glands about the hilum of the lungs. Examination of nose revealed double purulent eth-

moiditis and left frontal and maxillary sinusitis. Two days later at the hospital, under warm ether vapor anesthesia, by Dr. E. S. Smith, double middle turbinectomy, partial exenteration of right ethmoid and puncture and irrigation of much pus from left maxillary sinus was done. She made a prompt recovery and went home the next day. Was sent to Florida for the winter. Gained seven pounds. Lost her cough. Returned home in April, free from frontal or antral infection, and has been gaining in weight and health since her return. This case has been cited in detail as the story of what quite likely might have been avoided if the original foci of infection had been promptly removed as advised six years before.

Case 57.—Mrs. H. W. A., 47, referred by Dr. G. H. Janes for examination of the throat. For the past three years she has had much lameness and stiffness of her muscles. Her throat has been sore, dry and irritable for several months, with stiffness of muscles of neck. On examination, cheesy masses were extruded from the tonsils, and the left tonsil showed swollen patched follicles. Under ether by Dr. Janes, tonsillectomy was done. No adenoids present. Two years later this patient reports much improvement in her rheumatoid symptoms, with no sore throat.

Case 2282.—Mrs. F. S. B., 65. Referred by Dr. G. H. Janes, August 21, 1924. For forty years or more has had almost yearly attacks of tonsillitis, often followed by quinsy. Her most recent attack of peritonsillar abscess occurred last May. She has had two attacks of tonsillitis since May, and when I saw her she was recovering from the last attack. Both tonsils were dark red, as were the overlying pharyngeal pillars, while the left tonsil was much more enlarged than the right, protruding into the pharynx. For a number of years following her attacks of tonsillitis her knees have been swollen, lame and tender, but the arthritic symptoms cleared up pretty well each time after a few weeks of lameness. However, since her attack in May the joints of her fingers, wrists, elbows, knees, ankles and toes have been swollen, tender and painful. Her heels have been so tender and the lower lumbar region so lame that she has been able to get around the house with difficulty. The two attacks of tonsillitis that have occurred since May have added to her discomfort and disability. This

patient was brought to my office, and under local anesthesia careful, thorough tonsillectomy was done. At this writing, two days after operation, she is resting comfortably and declares her throat not nearly so sore as it has often been with tonsillitis. She is using salicylates as a gargle and internally, and says her joints are much more comfortable. Of course, it is much too early to forecast the results in this case.

Cases 2201, 2267 and 2268, seen July 23, 1924, are reported as a group of three children in the same family, with ages ranging from four to nine. All were convalescing from scarlet fever, desquamation of palms and feet not completed. One had an acute arthritis of ankles, knees and wrists and foul discharge from both ears. All had temperatures above 100° F. each evening, enlarged cervical glands, which in one child were as large as English walnuts. Cultures from each throat showed hemolytic streptococcus and micrococcus catarrhalis. Urinary examination in each case was negative. Under warm ether vapor anesthesia by Dr. Janes, at Noble Hospital, the throats of these little patients were relieved of infected tonsils and adenoids. They returned home the following day, and made an uninterrupted recovery, all being out of doors at quiet play the day following their return from the hospital. In two weeks time all discharge from ears, arthritis and enlarged glands had disappeared, and all three patients had gained much flesh. The parents were highly delighted with the progress made by these children.

Case 885.—E. B. L., 34, referred by Dr. J. B. Atwater, April 2, 1923. For ten days has had a severe head cold followed by inflamed eyes. The right eye had cleared up, but the left one showed a sluggish iritis. The iritis did not clear up under the usual treatment. A superficial keratitis developed and the eye became very red. The vision was reduced to 20/70. Nearly three years before, I had treated this patient for a sinus trouble and had then recommended the removal of his tonsils. As his eye symptoms did not clear up under the usual treatment, tonsillectomy was done, and a periapical alveolar abscess was evacuated by extraction of a tooth. The eye symptoms, which had persisted over a period of nearly four months, cleared up within a week.

CONCLUSIONS.

1. In certain types of acute angina, with threatening or developed atypical peritonsillar abscess and marked glandular involvement, immediate tonsilloadenoidectomy should be done.

2. In acute or chronic otitis, with or without mastoid involvement, if pathologic tonsils and adenoids can be demonstrated, their prompt removal is one of the first considerations, among other measures, that should be taken to cure the otitis and abort a surgical mastoiditis.

3. Infected tonsils and adenoids should be removed as a first step in clearing up any sinusitis.

4. Infected tonsils and adenoids should be removed as a first step in children subject to coughs, colds, bronchitis and bronchopneumonia.

5. In suspected or present juvenile tuberculosis removal of infected tonsils and adenoids should be a first consideration.

6. As a prophylactic measure against the acute contagious and exanthematous diseases in children with pathologic tonsils and adenoids, their early removal is indicated; and that in selected cases, for the purpose of aborting or cutting short a threatening or present secondary infection, tonsilloadenoidectomy may be used as a rational, even life saving, procedure. It may also be wisely employed as a means of shortening the period of contagion.

7. In unaccounted for hematuria, albuminuria, acute nephritis or pyelonephritis, the tonsils and adenoids should be suspected as the focus of infection, and if not above suspicion, prompt tonsilloadenoidectomy should be done to prevent structural changes in the kidneys.

8. In rheumatic or arthritic infections, in neuritis and certain types of goiter, if the tonsils are not above suspicion, tonsilloadenoidectomy is indicated for the removal of an infective focus prejudicial to the muscular, nervous and circulatory systems.

9. In obscure unaccounted for eye diseases, the tonsils and adenoids should not be overlooked.

10. Tonsilloadenoidectomy, if carefully done, in selected cases, during primary and secondary infective attacks is not attended by grave dangers to the patient but is a procedure of value to patient and surgeon alike.

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PARKS BUILDING.

XXXVI.

LATERAL SINUS THROMBOSIS PRESENTING UN-
USUAL VARIATION—STREPTOCOCCEMIA,
TRANSFUSION, RECOVERY.

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Variation in the clinical symptomatology of lateral sinus infection has absorbed considerable attention in recent literature, and in the case presented here was sufficiently confusing to cause transference to the medical ward for typhoid care for a considerable period during the course of the disease. Reversing the usual procedure and summarizing first, variations presented were:

Irregularities in infective evidence but subsidence of mastoid symptoms.

Persistent low leucocyte count and pressure of associated medical opinion that the case was typhoid.

Intermittent symptomatology in direction of intercranial involvement.

Remarkable response to blood transfusion in presence of profound bacteremia.

The pronounced low pulse rate following blood transfusion.

Unexpected recovery, either due to or in spite of necessary conservatism in procedure.

In presenting this report only salient points from the rather voluminous hospital record will be presented.

CASE REPORT.

This patient, James D., 12 years of age, was admitted during Dr. Randall's absence, to his service in the University Hospital, August 22, 1923. He had been seen irregularly in the outpatient service, with discharging ear since August 1st, and on advice ten days before to enter hospital for observation and possible mastoid operation, disappeared from view. Hospital records show the following:

Chief complaint.—Pain behind the ear.

History of Present Illness.—About three weeks ago patient developed pain and discharge in the left ear. This did not fol-

low nasal or throat cold. Patient had been swimming recently. The pain did not increase materially, and outside of hot boric douches no treatment was given. Within the past week the discharge lessened. Two days ago he had a chill, followed by fever, headache, anorexia and by acute pain and tenderness over the tip of the left mastoid. Fever has remained, reaching 104° last night, when patient was seen by family physician and referred into the hospital.

Physical Examination.—Temperature 100.4° , pulse 90, respiration 20. Auricle on left side not noticeably prominent. Evidence of mucopurulent discharge in external meatus. No pain on manipulation of auricle. No redness or edema over mastoid. Tenderness confined to tip of mastoid, and only of moderate degree on deep pressure. Posterior cervical chain not enlarged nor tender. Mouth—lips show beginning sordes. Tongue dry and heavily coated, breath fetid. Tonsils of small size and not diseased. Posterior pharyngeal wall, heart and lungs negative. On the same evening the writer was called to the case, incised the left tympanic membrane freely and ordered hot douches. White blood count, 6,800; neutrophiles, 87.

August 23. White count, 6,400; neutrophiles, 81; urinalysis negative; evening leucocyte count 5,100. Slight discharge from ear during the day. Local tenderness appears diminished. Fever continues high. Although patient complained of no more pain, he became increasingly more restless during the day, and towards evening became irrational. Had to be restrained. Re-examination disclosed no sign of meningismus. Heart and lungs negative, save for a slight untransmitted systolic apical murmur. No evidence of rose spots or splenomegaly. Lumbar puncture was done at 8 p. m. Clear, pressure 6 to 10, 4 monos., trace sugar, glob. negative.

August 24. White count, 4,200; neutrophiles, 86. Patient restless and delirious during night, did not sleep well; all this occurred without mastoid, surface or auricular canal symptoms. Patient seen by Dr. Leopold. Examination today. "Typical typhoid temperature, pulse and respiration. Spleen definitely enlarged and palpable. One doubtful spot on abdomen. No evidence of meningeal irritation. White count on successive days, 6,800, 5,100, 4,200. Believe that differential diagnosis rests between typhoid fever and a walled off brain abscess. Sug-

gest blood culture. Patient should be transferred to Ward D. In view of these findings operation (mastoid) should be delayed."

August 24. Notes in Medical Ward. Patient unsteady on feet, either weakness or ataxia; once got out of bed, tried to walk, did not fall to either side, but had tendency to go backward, going up on his heels; talked to imaginary persons. Does not appear particularly sick. No jaundice or cyanosis. Pupils equal, react to light and distance, no ocular palsies. No demonstrable sinus or mastoid tenderness, palpable lymph glands just under mandible. No pulsating vessels, chest normal. Examination at bases poor but no râles. Soft systolic murmur transmitted. Abdomen: Spleen definitely palpable. Liver palpable two fingers' breadth below costal margin. Exquisitely tender in right flank. No rigidity. No other masses. Peristalsis normal. Extremities: Reflexes normal so far as can be tested. Poor cooperation. No Babinski and no ankle clonus. Stereognosis and sense of position normal. No deformities, paralysis or atrophy.

Widal negative for typhoid and paratyphoid A and B. Later became delirious, talked incessantly, sees animals and friends about him. Refuses milk, calling it fish; says it will choke him.

August 25. Temperature normal, quiet, shivered once but no chill. Blood culture positive for streptococcus hemolyticus. Blood Wassermann negative. X-ray examination of mastoid: "A number of cells absent in left mastoid, probably due to abscess or acute mastoiditis. The lesion does not look old enough to be a chronic condition." Urinary examination shows albumin, many hyaline and granular casts. Later drowsy. Patient has been quiet all day. His lips have been dry and cracked. He is sleepy, at times has to be called several times to be aroused. There is no change in his physical findings, except that his ear is running more and there is bilateral abortive ankle clonus. X-ray reported over the phone says his mastoid cells are most all gone. In view of patient's favorable condition decided to await result of blood culture.

August 26. White count, 5,100; neutrophils, 82. Smear from ear shows staphylococci and streptococci. When right scapula is moved out of the way there is found a patch with impaired percussion note. There is no change in breath sounds

but there are both fine and coarse crackling râles. In view of these findings and slight dry cough would think of a pneumonia process, which, however, seems unlikely in view of the leucocyte count.

August 27. Dr. Miller found lungs negative. Dr. Baer examined eyegrounds—dilated retinal veins, especially left. Final report on blood culture of August 24: "Blood culture showed many small colonies of hemolytic organisms—not surface growth. Smear, gram positive cocci in chains and diplococci forms not lance shaped. Probably hemolytic streptococci." Transferred to Ward H for operation, performed by Dr. Babbitt. A small amount of pus and necrotic material removed from superficial cells and from antrum. The extent of apparent involvement did not appear to justify opening the lateral sinus, as patient's condition became very poor. After paracentesis of the drumhead a small strip of iodoform gauze was placed in the meatus, another in the antrum and the wound properly packed with plain gauze. The upper end of the wound was closed with three interrupted catgut sutures.

August 29. White count, 13,400; hemoglobin, 72 per cent. Urine negative.

August 30. Temperature normal.

August 31. Patient is beginning to have a chill. He has no tenderness over the jugular nor is there any evidence of a jugular thrombosis by palpation. There is no rigidity of the neck. 7 p. m.: Fever reached 105 and was reduced one degree by a tepid sponge. White count, 7,100—differential; neutrophils, 75 lymph., 23; L. M., 2.

September 1. Clinical picture now increases evidence of lateral sinus thrombosis and operation decided upon. Jugular vein ligated by Dr. Eliason; lateral sinus exposed by Dr. Babbitt at torcular end and jugular bulb; no pulsation in sinus; thrombic clots removed with free bleeding; sinus wall resected and packed open. Patient left table in good condition. White count, 8,100.

September 2. Patient's father typed and cross agglutinated; transfusion of 300 c. c. citrated blood given. Pulse good but slower.

September 3. Patient's condition good, no reaction except very slow pulse, suggesting possible intercranial pressure, ab-

scuss or meningitis with action on vagus, but no headache, stiffness of neck or other signs of intercranial involvement. Incision in neck clear and dry. Urinalysis now shows heavy trace of albumin, otherwise negative.

September 5. White count, 9,200; neutrophiles, 82; hemoglobin, 73 per cent.

September 7. White count, 4,400. Urine negative. Old leucopenia returned. Results former transfusion so favorable as to indicate repetition; no ear symptoms save moderate traumatic pain after dressing.

September 8. Transfusion 350 c. c. citrated blood and 100 c. c. normal salt solution. Immediately pulse slower; fell to 48 per minute eight hours after transfusion. Pulse strong; heart beats loud with marked sinus arrhythmia; no headache, paralysis or other nerve involvement, but patellar reflexes hyperactive.

September 10. White count, 7,600; hemoglobin, 71 per cent.

September 17. Urine, slight albumin trace, slight granular and hyaline casts.

September 18. Following a feverless interval of a few days the patient has for the past week been running a gradually increasing evening temperature, reaching 102 to 104 degrees. Despite this fever, his clinical condition seems improved sufficiently to warrant a wheel chair part of the day. There have been no chills preceding the evening rise, nor any localizing symptoms or signs until today, when it is apparent the patient is looking thinner and more anemic and is more excitable than usual during his dressing. The knee jerks are still hyperactive, but this activity is not found in the other reflexes. The only other neurologic signs are the continued congestion of the retinal vessels and some blurring of the disc margins; the left pupil is a trifle smaller than the right. General physical examination is negative, save for a persistent abdominal distention, relieved only by repeated enemata.

September 24. Blood culture: Report of blood culture, all plates well studded with deep colonies, around which there are punched out areas of hemolysis. Smear shows streptococci.

September 25. Examination by Dr. Pepper: "Review of case suggests that continuance of blood stream infection is to be attributed to a persistence of local infection in lateral sinus

or neighboring structures. The heart valves have not been attacked and no petechiæ are found. The spleen is still palpable. If no further local measures are indicated, mercurochrome might well be tried." Examination by Dr. Kern: "Spleen continues palpable, but is not tender; no perisplenic frictions. Heart normal size, no evidence of endocardial infection. Lungs clear, no evidence of osteomyelitis. It is to be concluded, therefore, that the focus from which the blood infection arises is the head lesion. A complete blood count is indicated. If there is anemia of any great degree, he should be transfused. Then mercurochrome may be considered. Its effects will, however, not be as beneficial as might be expected earlier in the course of a similar case."

September 25. Blood-red blood cells 3,840,000, white 8,400, hemoglobin 70 per cent. 9 p. m. Owing to inaccessibility of a donor for an intended transfusion, it was decided to give antistreptococcic serum transfusion. One-half hour after the skin sensitization test, 40 c. c. of antistreptococcic serum (Mulford) was given intravenously by Drs. Houser and Bachman, at 9:30 p. m. A nurse's record of the hourly temperature, pulse and respiration was begun.

September 26, 9 a. m. Following the administration of the serum the patient's temperature dropped to normal and remained so during the night. 4:30 p. m. 250 c. c. citrated blood and 75 of N. S. S. given by Dr. Bachman. A nurse's hourly record was ordered continued until midnight.

September 27. Blood count following transfusion: Red cells, 3,810,000; white, 8,900; hemoglobin, 78 per cent; differential, neutrophiles, 68; small lymphocytes, 21. Patient's clinical condition much improved. He had no reaction to the transfusion and the temperature has persisted normal, not rising above 99°. In view of this, further administration of serum, as well as mercurochrome previously considered, has been withheld. The reappearance of the eosinophiles in the differential seems to point favorably, and no further blood cultures have therefore been taken.

September 29. Patient is lively and mischievous and gaining weight. Appetite is increasing. Temperature remains near normal.

October 8. Blood count—red cells, 3,560,000; white 5,100; hemoglobin, 68 per cent; neutrophiles, 59 per cent; small lymphocytes, 35. Patient's clinical condition excellent; mastoid and ear discharge have ceased and wound shows tendency to close rapidly.

October 12. Blood culture negative.

October 13. Discharged in good condition; wound still open. To report to ear dispensary.

Wound closed four weeks later.

So much was due to the assiduous care of resident internes, Drs. Ferguson and Bachman, that it is appropriate to quote their words appended to this special report of routine procedure to me. "The features of the case which seemed most interesting and instructive were:

"1. The low leucocyte count in the presence of a marked local and later general infection of the streptococcic type, the highest count being 13,400, taken just after the first operation for drainage of the mastoid, and at that time showing a positive blood culture.

"2. The apparent success with which a septicemia was treated by repeated blood transfusions. This case was probably a most favorable one for such treatment, because in so doing leucocytes were supplied with which to combat the infection, leucocytes which the patient was unable to supply for himself.

"3. A low pulse rate may follow a blood transfusion. This phenomenon was most marked after those transfusions in which most fluid was put in the veins, and may be explained as a reflex action of the depressor nerve to the heart stimulated by the overfilling of the vessels at the time of the transfusion. It is probable that this phenomenon would be more marked following a transfusion to a child than would be the case in an adult."

Final Comment.—There is but little to add in review of this case; undoubtedly polymorphonuclear count at onset indicated prompt surgery, but mastoid evidence was so lacking and typhoid presumption so strong that this was delayed. In another such case should most certainly have adopted mercuriochrome injection. This, however, is more directly in light of quite recent evidence.

XXXVII.

EFFECTS OF SEPTAL OPERATIONS ON HEARING.*

BY D. H. TROWBRIDGE, M. D.,

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Some time since in a conversation with one of my esteemed confreres, a man whose judgment I value highly and a man of wide experience, he made the assertion that he did very few submucous resection operations on account of the fact that, in his opinion, they had little effect upon the hearing. This was so directly the opposite to my own opinion and experience that it set me thinking on the subject, and this paper is the result of our conversation. I am offering it in the hope that it may bring about a discussion of the subject, which certainly is quite important.

One must be impressed with the fact that in the great majority of cases who come for treatment for relief from deafness, particularly younger people, marked stenosis of one or both nostrils is observed, the most common deformity being a deflected septum, with or without a marked spur. This I have noticed so often that I have come to believe that a deflected septum, with or without other obstructive processes in the nose, has a marked effect upon the sense of hearing. The pathologic process brought about to reduce the hearing I am not trying to explain. It may be due to a low grade of inflammation, or it may be a negative air pressure during the process of swallowing. Other men of more experience and probably much more competent to observe have advanced different opinions but there does not seem to be any unanimity of expression. A study of the literature on the subject by the American Institute of Medicine failed to give any definite information. The consensus of opinion from their report, however, was in the affirmative—in other words, that the removal of nasal obstructions did benefit the hearing in a certain percentage of cases. They report, in part, as follows:

*Presented at the Western Section, American Laryngological, Rhinological and Otological Society, Los Angeles, 1924.

"Deviation and deflection of the nasal septum cause nasal obstruction, and deafness is mentioned among the chief symptoms of nasal obstruction. There are deflections of the septum which block the air stream—the passage of air to the lungs, to the sinuses and to the eustachian tubes and middle ears. If there is an impediment to the free passage of air, there is produced back of the impediment a negative pressure or partial vacuum. This may be felt in the ears, eustachian tubes and postnasal spaces. As a result of this negative pressure, there is produced a passive congestion, and with the addition of infection, all degrees of hyperemia, turgescence or actual hyperplasia. The clinical conditions produced by this pathologic sequence include all forms of rhinitis, postnasal catarrh, chronic catarrhal deafness—from a simple congestion of the tubal orifices to an extensive involvement of the structures of the middle ear. An operation such as the submucous resection of the septum is an ideal therapeutic procedure applied not to the temporary palliation of the symptoms but to permanent removal of their cause."—C. L. Stone, Long Island M. J., October, 1920.

E. A. Woods, Northwest Med., August, 1921, says: ". . . One more condition which should not be overlooked. I refer to the effect upon the hearing. Many patients come to the office complaining of deafness in one or both ears, of variable degrees, whose difficulty is located as being due to a closure of the eustachian tubes. A deflected septum, causing a rarefaction of the air posterior to the point of obstruction, will in time collapse the eustachian tubes, and after the closure becomes permanent the hearing begins to be affected."

H. T. Bailey, Southwest Med., Feb., 1923, says: "If you find a deviated septum, operate, even if your patient has no ear symptoms, for he is likely to have them at any future time. In adults with suppurative otitis media it is as necessary to look for deviated septum as it is to look for adenoids in children. If the front part of the septum is straight, look far back and look for the deviation towards the affected ear."

W. F. Bonner, Delaware State M. J., Jan.-March, 1922, says, in part: "Ordinarily the indications for submucous resections are the nasal occlusions; and for the treatment of conditions that may be secondary to a deflected septum, such as

chronic catarrhal otitis media, chronic purulent otitis media, anosmia or loss of smell, and occasionally for recurrent attacks of sinusitis."

A questionnaire to about 200 aurists throughout the United States and Canada, resulted in about 75 replies. The following questions were asked:

1. In your experience what has been the effect of deviated nasal septum and nasal stenosis upon the hearing?
2. Have you found the correction of deflected septum produces a favorable result in ears that have already become more or less deaf?
3. What percentage of cases improved?
4. Please give particulars and suggestions.

Of the 75 replies received, at least 75 per cent of the answers to the first question were in the affirmative.

To the second question the replies varied greatly.

To the third question, What percentage of cases improved? the percentages given varied from 10 per cent to as high as 50 per cent. Many of the men who replied placed particular stress upon the necessity of early operation, with the idea of prophylaxis rather than a cure. I think, in fact, it was the opinion, almost unanimously, that the earlier the work is done the better the chances of improvement. One aurist is so enthusiastic that he feels the hearing is improved in practically every operated case. However, he rejects operation in cases where the air conduction apparatus is involved, and I do not think any of us would expect improvement in pronounced otosclerosis or where the labyrinth or nerve was involved.

One of the men who replied quite at length, a prominent aurist and a man of wide experience, is of the opinion that nasal stenosis has little effect upon the ears and that a good deal of the trouble starts in the eustachian tubes and in the middle ear. He cited one case in which the hearing was perfectly normal, in spite of the fact that there was complete closing of both nasal cavities, a condition that evidently had been present from birth, the patient being an adult. He closed by saying, "There is yet much to be learned in reference to deafness, and the usual stereotyped causes need a thorough renovation."

One confrere from Brooklyn estimates that 50 per cent of cases are improved by this operation, while another from New Haven claims that more than 50 per cent are improved.

Another, a man of wide experience, from Indianapolis, claims that middle ear cases due to tubal closure and without element of nerve involvement are benefited. He feels that otologists usually promise too much as a result of the correction of nasal deformities. Another man from New York reports that nasal stenosis is the most frequent cause of lowered hearing and that a large percentage of cases are improved by operation. Another prominent New York otologist reports from 50 to 60 per cent of cases improved. Work that is thorough but not too radical is recommended.

A confrere from California states that he himself was hard of hearing over a period of many months and was completely relieved by a submucous resection. He does not think, however, that in general he gets much improvement. The only suggestion of a prominent New York otologist was that no promise of improvement of hearing should be based on septal operations.

These replies are only a few of the many received and are the definite opinions of men of large experience and prominence. The difference of opinion is really quite interesting, although as before stated, a very large majority answered in the affirmative, in other words, that submucous resection operations for the correction of nasal deformities have a marked beneficial effect upon those cases suffering from middle ear deafness.

Personally, my own experience has been in the affirmative also, in a large percentage of cases. For several years I have kept a record of the results obtained following operations. In private practice it is of course not easy to follow up cases, but I wish to report a few I consider typical. I agree with some of the men quoted that too much should not be promised. I always make it a point to tell the patient that I cannot promise anything, but that some cases have been markedly benefited; that I think the correction of nasal stenosis and subacute involvement very apt to have a restraining influence, if indeed it does not produce an improvement in the hearing. I do not expect improvement in cases of labyrinth or nerve deafness.

Mr. F. R. W., operated on Jan. 27, 1923. Hearing before operation was: Watch, R. 24/72, L. 10/72. Examined Feb. 12th, his hearing for the watch remained the same in the right ear, but had increased to 18/72 in the left. Examined last on Aug. 29, 1923. Hearing for watch was as follows: R. 54/72, L. 40/72.

Mr. R., examined March 3, 1921. This case was of very long standing and the hearing was very deficient, being—Watch, R. 15/72, L. 8/72. A submucous resection operation was performed, and April 16, 1921, his hearing for the watch was: R. 15/72, L. 24/72. Examined five months later, I found further improvement, hearing for the watch at that time being: R. 36/72, L. 36/72.

Mr. G., examined Dec. 28, 1920. Hearing: Watch, R. 12/72, L. 20/72. A submucous resection was performed, and a test of his hearing some time later showed much improvement, being: Watch, R. 40/72, L. 60/72.

Mr. S., an employee of the Southern Pacific Company, came to me Dec. 30, 1922, and I found his hearing for the watch reduced to: R. 15/72, L. 12/72. Examined Nov. 13, 1923, following operation I found his hearing for the watch normal in both ears.

Miss F., Reedley, Cal., examined Sept. 5, 1923. Hearing as follows: Watch, R. 48/72, L. 36/72. Two weeks after operation the hearing was normal in either ear.

Mrs. H., examined Nov. 16, 1923, hearing markedly reduced, being: Watch, R. 20/72, L. 7/72. Within a month following operation the hearing for the watch was perfect in the right ear and 15/72 in the left. Examined last on Jan. 3, 1924, for the watch she heard—R. 72/72, L. 50/72.

In conclusion, I will say that I think the evidence here produced shows that in a great many cases relief of nasal stenosis has either improved or cured a great many cases of deafness which ordinarily would be considered hopeless. We all know that the removal of tonsils and adenoids cures many cases of deafness in children, and if an obstruction from the tonsils and adenoids will cause deafness, why should it not likewise be caused by nasal stenosis in an adult? This being true, I feel

that all cases of decided septal deformities with a spur, or where the nose is obstructed by enlarged turbinates, should be corrected by operation. In nearly all cases the nasal cavity can be made much more roomy, and there need be no sacrificing of the Schneiderian membrane, since the lower turbinates may be pressed back forcibly with a blunt instrument.

719 PATTERSON BUILDING.

XXXIX.

TRAUMATIC DEAFNESS AS A RESULT OF RETRUSION OF THE CONDYLES OF THE MANDIBLE (PRELIMINARY REPORT).*

BY JAY C. DECKER, M. D.,
SIOUX CITY.

About a year and a half ago Dr. H. F. McGrane, one of our local dentists, asked me whether I had ever seen a case of deafness as a result of improper artificial dentures. Up to that time I had never given the matter any thought, nor had I seen any literature dealing with malposition of the jaws as an etiologic factor in such cases and, to be perfectly frank, I was very skeptical.

About this time, however, Rev. V. came to my office, complaining of impairment of hearing and frequent accumulation of wax in the external auditory canals and some roaring in the ears. I cleansed the external auditory canals of a slight amount of wax and inflated the middle ear with a eustachian catheter. He had had his lower teeth removed some two years previously, but had never worn an artificial denture.

I advised him to have a denture made, which he did. He reported to me a few months later that "within two weeks after he began to wear the denture he could hear as well as he ever could" and the roaring was entirely relieved. He has had no recurrence up to this time.

This aroused my interest, and I have, during the past year, carefully observed several cases, which I will report at this time, hoping at some future time to supplement this report with other cases and further observations on the ones here presented.

In order to explain these conditions, one must have an understanding of the anatomy of the temporomandibular joint and of the changes that take place in the mandible following the removal of particularly the molar teeth.

*Read before the Sioux Valley Eye and Ear Academy at its Summer meeting in Omaha, Neb., June 30th, 1924.

The temporomandibular joint is, according to Prentiss,¹ "a gliding hinge joint or gliding movable joint." The surfaces entering into this movement are the elliptical condyle of the mandible and glenoid concavity of the temporal bone, continuous with the eminentia articularis convexity. In other words, a convex circumscribed surface articulating with a concavo-convex surface.

Interposed between the condyles of the mandible and the concavoconvex surface of the temporal bone is a fibrocartilage meniscus, which adjusts itself to the movements of the condyle."

All joints with a free gliding movement present such a meniscus, as the sternoclavicular and femorotibial joints.

In the Dental Cosmos for June, 1918, Prentiss² called attention to the absorption of the meniscus, in various degrees, due to the loss of teeth, it being, of course, the loss of teeth which permits the pull of the masticatory muscles to bring pressure of the condyle upon the meniscus. The degree of this destruction varies from a mere thinning and pressure atrophy to a perforation or complete destruction of that portion of the meniscus with which the condyle comes into contact.

In immediate or very close relationship to the glenoid fossa are the glasserian fissure, which lodges the processus gracilis of the malleus and transmits the tympanic branch of the maxillary artery.

The eustachian tube passes through a canal just internal to the condyle, and on the outer side of the eustachian tube lies the chorda tympani nerve. The tympanic portion of the temporal bone is in front of the petrous portion and forms all but the roof of the bony portion of the external auditory canal. The part that forms the anterior wall of the auditory canal and the tympanum is called the "tympanic plate." This plate is thin and separates the bony portion of the external auditory canal from the glenoid fossa.

From this review of the anatomy, it is evident that the condyle of the mandible is near the tympanic plate, under normal conditions.

By means of a mechanical device, Dr. Gysi of Switzerland has shown that a crushing pressure of sixty pounds on the sec-

ond molar teeth is accompanied by a pressure of twenty-seven pounds on the balancing (or opposite) condyle, while no fulcrum making force was recorded at the working condyle. This shows the force that is exerted at the angle of the jaw during mastication.

After the molars are lost, the body immediately anterior to the angles of the mandibles becomes weakened, due to the great amount of atrophy.

Continued pressure by the masseter and internal pterygoid muscles at this weakest point soon causes a widening of the angle, forming an obtuse instead of a right angle, with a lengthening of the distance from the condyle to the symphysis.

If the lower anteriors remain in normal occlusion with the upper teeth, posterior displacement of the condyle must compensate for the additional length of the mandible.

When the condyles of the mandible are habitually retruded, the pressure causes a gradual absorption not only of the inter-articular fibrocartilage but also of the structures surrounding the joint, which may include part of the tympanic plate opposite the point of greatest pressure. The condyle, being in relationship with the cartilaginous portion of the canal, causes a compression of the external meatus, which may vary from a flattening of the anterior wall to almost a complete closure, as in Case II reported.

This constriction of the canal, together with the continued pressure and irritation upon the tympanic plate, to which the membrana tympani is attached, and the irritation from the continued click or pound, as the condyles slip back with each closure of the mouth, seems to cause a partial or total loss of hearing, to which Wright of Pittsburg has given the name "traumatic deafness."³

Wright furthermore states that "any loss of teeth which allows the jaws to approximate each other in what is termed 'a closed bite,' with continued effort on the part of the patient to retrude the mandible during mastication, should be regarded as a possible cause of existent deafness. Abrasion and malposition of the teeth which permit abnormal relationship of the mandible and maxilla may produce the same condition and be a causative factor in the impairment of hearing."

The following cases are presented for consideration:

Case 1.—Mrs. G. A. T., age 35, first seen June 27, 1923, complained of impairment of hearing, which began twelve years ago, and has been gradually getting worse. Four years ago, at the time when her last dental work was done, consisting of stationary posterior bridges, upper and lower, on both sides, the distance between the maxilla and mandible was decreased so as to permit incisal contact with anterior teeth, which she did not have previous to this time.

Her father was deaf at middle age and died at 58. One sister, living, has some impairment of hearing in one ear. Patient has been an elocutionist on the Chautauqua platform, but her hearing became so poor that she was compelled to give up the work, as she has considerable difficulty in carrying on a conversation. In general appearance, patient is markedly depressed.

Right ear, hears whispered voice 10 inches; left ear, hears whispered voice 8 inches.

Right ear, hears C_2 fork, air conduction, 20 seconds; right ear, hears C_2 fork, bone conduction, 20 seconds.

Left ear, hears C_2 fork, air conduction, 15 seconds; left ear, hears C_2 fork, bone conduction, 15 seconds.

Hears watch, right ear, four inches; left ear, on contact. Rinne negative; Weber referred to left.

On inspection, membrana tympani shows area of light reflex reduced in both ears. Left external auditory canal smaller than right, seems flattened on anterior wall. On palpation, marked intrusion of condyles is noticed, more marked in left ear.

Treatment.—She was referred back to Dr. McGrane, who supplied her an intermaxillary splint, resting on the lower teeth and opening the bite 5 mm., which she was to wear constantly. This splint is made of rubber and is a sort of cap which sets over the posterior teeth on each side and is connected by a lingual bar.

Subsequent Record.—January 19, 1924. Patient is still wearing intermaxillary splint, and in general appearance she is much brighter and more lively in every way, carries on a conversation perfectly without effort.

Hears watch, 18 inches with either ear; hears C_2 fork each

ear, air conduction, 35 seconds; hears C_2 fork each ear, bone conduction, 20 seconds. Rinne positive at this time. Merybrana tympani appear the same. Hears whispered voice two feet with either ear. Left auditory canal much larger, still slightly flattened on anterior wall.

This patient had no further treatment whatsoever, except the opening of the bite to relieve the retrusion of the condyles.

June 19, 1924. Patient's condition practically unchanged since January.

Case 2.—Mrs. J. M. K., age 56, first seen March 13, 1924, with hearing for past four or five years gradually getting worse; complains of intermittent roaring in the ears. At this time can hear whisper, right ear, 6 feet; left ear, 12 feet.

Hears watch, right ear, 4 inches; left ear, 6 inches. Hearing with C_2 fork, air and bone conduction, reduced, both ears. Rinne positive; Weber not lateralized.

Both external auditory canals reduced in size, amounting to almost complete occlusion; size varying with the movements of the jaws. With fingers in the external auditory canals, a sharp click is felt and marked retrusion of condyles of mandible as jaws close.

Patient had lost all teeth 25 years ago; has worn full upper and lower dentures 20 years.

Patient was given a new full upper and lower artificial denture, increasing the distance between the maxilla and mandible 7 mm., more than with previous artificial dentures.

May 19, 1924. Patient has worn new dentures two months and now hears whispered voice, right ear, 9 feet; left ear, 15 feet. Says she hears general conversation much better and does not have so much roaring in the ears; sounds much more clear and do not appear to be muffled as formerly.

June 20, 1924. Air and bone conduction for C_2 fork practically normal; hears whispered voice 20 feet with either ear.

Case 3.—Mrs. W. H. B., age 55, first seen March 24, 1924; has been deaf for years; head noises most of time. Has worn full upper and lower dentures for 30 years.

Cannot hear C_1 , C_2 or C_3 fork by air conduction; hears C_2 fork by bone conduction with both ears. Weber referred to left. Patient says hearing has been worse since last set of teeth were made, five years ago.

Measurement of face shows a marked lessening of distance from anterior nares to the symphysis; has considerable retrusion of condyles. Advised new artificial dentures, increasing distance between maxilla and mandible.

May 12, 1924. Patient has had new dentures constructed, increasing the distance between maxilla and mandible 14 mm. This denture she has worn for eight days. Now hears C_2 fork at two inches, by air conduction, for a few seconds; bone conduction, more acute and time increased. Hears C_1 fork, right ear, by bone conduction, for a very short time.

June 6, 1924. Patient reports by letter that she can hear the clock strike for the first time in 20 years.

The following is an extract from a letter of recent date received from the patient's husband:

"Dear Doctor—Have been holding off writing in regard to Mrs. B.'s condition until I could have something worth while to say to you. That Mrs. B. can hear better, especially in her right ear, there can be no doubt. It was a comparatively short time until she could notice certain class sounds that she had not heard before; such sounds as the little children calling each other, her little grandchild whistling, meat popping while frying on the stove, etc. Couple days ago she heard the clock strike, so as I say, there is no doubt that her hearing is improving."

Case 4.—Mr. J. T. N., age 54, first seen March 19, 1924, complains of impaired hearing, worse in left ear; cannot hear over telephone or in a crowd. Never has had any inflammatory trouble with the ears. Has had upper and lower molar teeth out for several years. Has just had the balance of upper teeth extracted.

Hears watch, right ear, on contact; hears watch, left ear, not at all; hears C_2 fork, air conduction, right ear, 20 seconds; hears C_2 fork, air conduction, left ear, 15 seconds. Bone conduction, both ears, nearly nil. Cannot hear whispered voice.

Membrana tympani are slightly thickened and dull in appearance.

Treatment.—Prescribed new full upper and lower dentures, with normal facial measurements reproduced.

June 2, 1924. Patient says since wearing the dentures that if he leaves them out at night he does not hear so well in the

morning. No other noticeable change except an increase of five seconds in the hearing time of a C_2 fork by bone conduction.

Case 5.—Miss Lila H., age 40, first seen May 26, 1924. Hearing has been impaired for a long time, gradually getting worse the past ten years.

Hears watch on contact, faintly, with both ears. Hears whispered voice, right ear, 3 feet; hears whispered voice, left ear, 2 feet. Cannot hear C_2 fork, left ear, air conduction; hears C_2 fork, left ear, bone conduction, 20 seconds.

Inspection of membrana tympani shows marked lessening of area of light reflex. Has considerable retrusion of condyles of the mandible, with flattening of anterior wall of external auditory canals.

Measurements of face show shortening of distance from symphysis of mandible to the anterior nares.

Examination of her teeth shows loss of first lower six year molars, together with the anterior movement of second and third molars, as well as abrasion of the occlusal surfaces of the remaining bicuspid and molars, with a crowding back of the lower anteriors underneath the upper anteriors.

Treatment.—An intermaxillary splint, resting on the lower teeth, was prescribed, increasing the distance between maxilla and mandible 5 mm.

June 20, 1924.—Patient has worn intermaxillary splint for about four weeks. Shows an increase of eighteen inches in the distance she can hear the whispered voice. No other change up to date.

Case 6.—Mrs. J. M. F., first seen June 10, 1924. Complains of impaired hearing, first noticed about a year ago, and is gradually getting worse. Had all her teeth out and has worn artificial dentures for several years. Had a new set of dentures made about a year before she began to have trouble with hearing. General health good. Nose and throat appear normal.

Hearing, whispered voice, right ear, 2 feet; left ear, 8 inches. Hears watch, right ear, 2 inches; left ear, 3 inches. Hears C_2 fork, air conduction, right ear, 20 seconds; left ear, 25 seconds. Hears C_2 fork, bone conduction, right ear, 18 seconds; left ear, 12 seconds. Weber not lateralized.

Retrusion of condyles more marked on right side. Marked grinding and cracking of meniscus on opening and closing jaws, sufficient to be very annoying to patient. Facial measurements show shortening of lower one-third.

Treatment.—New artificial dentures, opening bite 7 mm.

June 28, 1924. Patient says she does not notice the grinding and crackling on moving the jaws. This disappeared immediately after getting the new dentures.

Has worn the new dentures two weeks and now hears whispered voice three feet with either ear.

SUMMARY AND CONCLUSIONS.

In considering the above six cases, in addition to the first case mentioned, in which, I am sorry to say, I have no accurate records and simply vouch for the improvement in hearing of the minister mentioned, which he says "was very quickly noticed by him" and certainly was very noticeable to me when I talked with him several months afterwards, we find the following:

All seven of these cases had a closed bite, varying from 4 to 14 millimeters; five of them wearing artificial dentures or were edentulous; two showed a closed bite because of abrasion and malposition of the teeth.

In all of these cases the trouble began after the extraction of part or all of the posterior teeth, and in case of Mrs. B. (Case 3) was markedly worse after the last artificial dentures were made, five years ago. All of these cases, excepting Case 4, in which the improvement was slight, if any, have shown improvement in hearing after reestablishment of the normal relationship of the mandible to the maxilla. In Case 4, however, the almost complete loss of hearing by bone conduction made the prognosis in this case very bad to begin with, and, I should say from my limited observations, that where the hearing by bone conduction is markedly reduced, one should not expect marked improvement.

In determining normal relationship of the mandible to the maxilla, Dr. H. F. McGrane of Sioux City, to whom I am indebted for the dental treatment of these cases and much valuable cooperation in their subsequent observation, has called my attention to the fact of the close relationship in the average

face of the measurement from the symphysis of the mandible to the anterior nares, from the anterior nares to a line drawn through the center of the eyebrows, and in many cases from this line to the hairline. The average distance is two and one-half inches. This rule, however, will vary slightly in the long, peaked face and in the abnormally broad face.

The classification of faces by Dr. Leon Williams of London and Dr. Gysi of Zurich, Switzerland, into square, tapering and ovoid with modifications is mentioned to show the relative facial dimensions for esthetics which must be considered in the construction of artificial dentures, as well as the normal position which the head of the condyle should occupy.

In closing, I would like to say that while a few dentists, notably Wright of Pittsburg and Munson of St. Paul, have recognized the relationship between malposition of the condyles of the mandible and certain cases of impaired hearing, I have been unable to find a single printed article in the otologic literature dealing with this subject.

I hope, by bringing these few cases to your attention, and by urging you to pay more attention to the position of the condyles and to the facial measurements as an aid in determining the normal position of the mandible, you may, by cooperation with the dentist in selected cases, give aid to some of the patients that you have been unable to benefit by other means.

I also hope, by educating the laity to the fact that every mouth should have a full denture, either natural or artificial, and by education of the dentist to the fact that great harm can be done by allowing too close proximity of maxilla and mandible, we may be able to prevent the occurrence of many cases of impaired hearing which have been, in the past, considered incurable.

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XL.

CASE HISTORIES OF OTITIC BRAIN ABSCESS
OBSERVED AT COOK COUNTY HOSPITAL.

By C. F. YERGER, M. D.,

CHICAGO.

A study of individual case histories has some advantages over a statistical study of a large group of cases, although both have their fields of usefulness as an aid in diagnosis and treatment. The case history will bring into plain view our mistakes of omission or commission; it will also bring out valuable points which were an aid to a successful diagnosis or treatment. It is through our mistakes or successes that we learn most forcibly the lessons of experience. As the old saying goes, it is a wise man that learns from the mistakes of others and profits by them. This is especially true of the surgeon, as it may be the means of saving life and preventing unnecessary morbidity.

The following cases of otitic brain abscess were observed at Cook County Hospital, in the decade from 1911 to 1920 inclusive, and include only those in which the diagnosis was confirmed either by operation or necropsy, altogether eighteen cases.

Case 1.—B. A., male, age 26 years, admitted April 15, 1918, with the following complaints: Severe pain over left frontal region, discharge from left ear and mental impairment. Onset and course: Had foul smelling purulent otitis media (left) more or less constant for past three years. Last night he suddenly complained of severe headache over the left frontal region and since has been unable to answer questions rationally, although conscious. Examination shows patient in a semi-comatose condition; temperature 103.4, pulse 104, respiration 32; white blood count, 16,300. Left ear shows slight amount of foul discharge in canal. Neck is slightly rigid; Kernig positive, bilaterally; patellar jerks increased. Patient displayed an inability to give a name to objects shown him (anomia).

Diagnosis: Otitis media suppurativa chronica and mastoiditis with secondary temporosphenoidal brain abscess (left).

Operation, April 15, 1918. Radical mastoid and drainage of brain abscess. Brain searcher introduced into left temporosphenoidal lobe evacuated 15 c. c. of thick, foul smelling pus.

Postoperative: On the fourth postoperative day the temperature became normal; the memory was still impaired for naming articles (anomia), and he could not remember the names of his two children (amnesia). On the 12th postoperative day it was noted that his memory had improved markedly, and on the 24th day he was discharged from the hospital; his general condition was good, and he was free from anomia and amnesia.

Comment: This case was one of left temporosphenoidal lobe abscess, associated with chronic suppurative otitis media, that recovered after operation. The onset was sudden, with severe headache 24 hours previous to the diagnosis and operation; the diagnosis and localization were made upon one finding—i. e., anomia, which is pathognomonic of a lesion of the left temporosphenoidal lobe; the anomia and amnesia were still present after the fourth day of drainage of the brain abscess but disappeared later. Lumbar puncture was not done. This should never be omitted in any otitic case with suspected intracranial complications.

Case 2.—B. A., admitted February 29, 1920. Present complaint, headache, left earache and discharge from left ear. Onset and course: Sick four weeks with ear trouble with pain in left ear; has had headache for past week, which became severe since ear stopped discharging; vomited day before yesterday.

Examination shows temperature 99.4, pulse 60, respiration 20; slight discharge from left ear canal and slight tenderness over the left mastoid bone; W. B. C., 14,800.

Diagnosis: Acute suppurative otitis media and mastoiditis (left).

Operation, March 3, 1920. Left mastoidectomy on account of persistent headache and some tenderness over the mastoid. Findings negative.

Postoperative: For a week after, the temperature remained usually normal; on two days he had fever not going above 100°; the pulse was slow, reaching as low as 58. On the eighth

day examination showed temperature 98.6, pulse 52. Does not respond to questions; is distinctly tender on percussion over left temporal region; has paresis of right side of mouth, and neck is slightly rigid; spinal fluid clear under increased pressure and containing 60 cells per cu. mm., and W. B. C., 26,000.

Operation: Drainage of brain abscess. Dura covering tegmen tympani was dark red and lusterless, and presented some granulations; dura incised; temporosphenoidal abscess opened and 60 c. c. of yellow pus escaped, which on smear showed pneumococci.

Postoperative: Next day patient's mentality was very much improved, answers questions and exhibits but very slight sensory aphasia; facial paresis less, rigidity of neck much less; pulse rate normal; drainage is very profuse. On the second day the mental condition was not so good; temperature 103.4, pulse 100, respiration 24, and definite sensory aphasia present. On the fourth day, temperature 101, pulse 100, respiration 24; complains of headache, is stuporous; rigidity of neck and bilateral Kernig present; spinal fluid shows 56,000 cells. On the seventh day the patient died. The patient developed an active delirium with generalized tremor; temperature high, pulse and respiration rapid, and marked rigidity of extremities and retraction of neck.

Comment: This was a case of left temporosphenoidal abscess associated with acute suppurative otitis media, without mastoid involvement, which resulted fatally through the development of an acute diffuse suppurative leptomeningitis after drainage of the brain abscess.

A case of acute suppurative otitis media of four weeks' duration, with a history of headache, vomiting and slow pulse should have led at once to the suspicion of an otitic brain abscess and an investigation along these lines. At this stage a lumbar puncture was not done and this was inexcusable. After doing the mastoidectomy and not finding anything to account for the symptoms, this of itself should have suggested further investigation. Furthermore, nothing was done for a period of seven days following the mastoidectomy, although the patient still complained of headache and was stuporous and had a slow pulse (58). On the eighth postoperative day an examination showed plenty of evidences for the diagnosis of an ab-

scess of the left temporosphenoidal lobe, viz., slow pulse (52), normal temperature, 60 cells in spinal fluid, facial paresis, history of otitis media suppurativa, aphasia, rigidity of neck, tenderness over left temporal region and W. B. C. 26,000. The patient had a mastoidectomy performed and was in the hospital for 11 days before otitic brain abscess was diagnosed and operated on. Diffuse septic meningitis developed two days after drainage of the brain abscess.

Case 3.—C. M., male, age 34, admitted June 20, 1919, with the following complaints: Otagia and otorrhea (left), facial paralysis (left), headache and fever. Onset and course: Left ear has discharged as long as he remembers. Otagia began three weeks ago, when the ear ceased to discharge. Has had fever and severe headache for the past two weeks. Has noticed failure of left eyelids to close for past week.

Examination: Temperature 102.6, pulse 70, respiration 32. Face shows left peripheral facial paralysis and some neck rigidity. Left ear, seropurulent discharge, granulations in Schrapnel's membrane, mastoid tenderness; Brudzinski suggestive; W. B. C. 15,000. Spinal fluid cloudy, under increased pressure; globulin increased, 5,000 cells per cu. mm., mostly polymorphonuclears, and pneumococci (culture).

Diagnosis: Chronic otitis media suppurativa, acute mastoiditis and purulent meningitis.

Operation: Radical mastoid and drainage of brain abscess (left). The tegmen tympani was removed, the dura incised and the temporosphenoidal lobe explored but no pus found. An attempt was made to get into the posterior fossa in front of the sigmoid sinus, but this was not possible, due to the sinus being so far forward. Bone was then removed so as to expose the cerebellum posterior to the sinus. In so doing, a splinter of bone wounded the sinus, and free bleeding resulted, which was stopped by gauze packing. The dura was then incised and a grooved director was passed forward, which liberated a few drops of pus.

Postoperative: First day, Kernig positive, temperature 104, pulse 96, respiration 30; second day, left eye deviates to the left (sixth nerve paralysis); Kernig, Brudzinski and neck rigidity increased; temperature 103.2, pulse 80, respiration 36. Died on third postoperative day.

Comment: This was a case of chronic suppurative otitis media and mastoiditis with cerebellar abscess, which had developed a diffuse pneumococcic leptomeningitis before coming to the hospital. Cerebellar symptoms were absent.

Case 4.—B. A., male, age 12 years, admitted April 20, 1913. Onset and course: Has had discharging right ear for past six years. Complained considerably of headache two or three days ago.

Examination: Temperature 97, pulse 60, respiration 20. No discharge from right ear; no swelling or tenderness over right mastoid. A marked horizontal nystagmus is present. W. B. C. 11,300.

April 21, 1913. Temperature 99, pulse 70, respiration 22; temperature 98.6, pulse 60, respiration 20. Is stuporous, complains of headache, slight ptosis of right eye; vertigo more marked to right side; spinal puncture clear, 30 drops to the minute.

April 22, 1913. Is stuporous and complains of headache; temperature 98, pulse 54, respiration 20.

April 24, 1913. Pulse 60 all day.

Operation: Right radical mastoidectomy and drainage of cerebellar abscess. No pus found in mastoid.

After operation temperature became intermittent, from 101 to 104; nystagmus was marked to the right. On the sixth day the right ankle became red and swollen; on the thirteenth day patient became very stuporous, the neck and back were rigid, Kernig marked and a right Babinski present; temperature 102, pulse 112. A constant tremor of the left hand five days later, which developed into a general tremor, most marked on the left side. Patient died on the nineteenth postoperative day.

Comment: This was a case of otitic cerebellar abscess without mastoid involvement. The findings in favor of a cerebellar abscess were history of suppurative otitis media, slow pulse (54), headache, but little or no fever, clear spinal fluid (the spinal fluid cell count was not recorded) and horizontal nystagmus directed towards the diseased ear. Septic sinus thrombosis was indicated by the septic fever curve, and metastatic purulent arthritis and septic meningitis by the marked bodily rigidity and stupor.

Case 5.—O. M. A., male, age 19 years, was admitted December 22, 1919, with the following complaints: Pain and swelling behind the right ear and fever. Onset and course: Had discharging ear for past three months; discharge stopped nine days ago, and pain and swelling began over the tip of the mastoid. Has had high fever during past week.

Examination shows temperature 103.6, respiration 24, pulse 104; slight discharge present in right ear canal, with marked sagging of the posterior superior canal wall. There is edema, swelling and tenderness over the right mastoid with fluctuation over tip of mastoid.

Diagnosis: Acute suppurative otitis media and mastoiditis, Bezold's abscess.

Operation December 22, 1919. Right mastoidectomy showed empyema of mastoid, especially involving the tip cells. Perforation had occurred through outer table at tip of mastoid.

Postoperative: Three days after, complained of dizziness. On the fourth day complained of severe headache and dizziness. Examination showed a marked nystagmus to the right with no response to caloric test in right ear. Hears C_3 fork with right ear. Marked rigidity of neck; Brudzinski, Kernig and Babinski are markedly positive. Reflexes exaggerated. Lumbar puncture showed spinal fluid not under pressure; fluid very cloudy; cell count 11,900. W. B. C. 28,000.

Diagnosis: Meningitis, cerebellar abscess.

Operation, December 26, 1919. Drainage of brain abscess. Anterior to the sigmoid sinus a small amount of pus was seen. An incision was made through the dura parallel to the sinus and a brain searcher introduced anteriorly and medially, and 2 c. c. of pus obtained. The dura was elevated anteriorly to the sinus and 4 c. c. of pus obtained in the region of the saccus endolymphaticus.

Postoperative diagnosis: (1) Empyema of saccus endolymphaticus, (2) labyrinthitis, (3) cerebellar abscess, (4) meningitis.

Death occurred 48 hours after drainage of brain abscess.

Case 6.—B. A., age 14 years, admitted November 30, 1919. Present complaint: Left earache and discharge. Onset and course: Earache began 48 hours ago and has become worse;

discharge has been present for past two days following paracentesis in this dispensary.

Examination: Temperature 99, pulse 96, respiration 22. There is sagging of the superior posterior canal wall of the right ear; the drum membrane is red and bulging; very slight tenderness over the tip of right mastoid.

Diagnosis: Acute suppurative otitis media.

December 2, 1919. Temperature 99.8, pulse 90, respiration 20. Complains of earache and dizziness.

December 3, 1919. Temperature 101.6, pulse 94, respiration 18. Had severe jerking of lower limbs and dizzy.

December 6, 1919. Complains of severe headache; W. B. C. 38,000.

December 8, 1919. Temperature 98.6, pulse 86; profuse drainage; up and about.

December 11, 1919. Temperature 101.6 to 104.4; complains of pain in back; W. B. C. 18,000.

December 12, 1919. Temperature 103.6 to 104.6; stuporous; tenderness over mastoid continues; discharge has lessened greatly; W. B. C. 46,000.

December 13, 1919. Temperature 102.8 to 104.6; stuporous; ear discharge slight; neck rigid; Kernig and Brudzinski positive; right Babinski and Oppenheim present. Spinal puncture shows fluid cloudy, 350 cells; globulin present; many polymorphonuclear cells; no organism in smear and culture.

Operation: Mastoidectomy.

Postoperative: Temperature for ten days after ranged from 97.8 to 100.8, and patient still complains of headache; on the tenth day a bilateral papillitis was noted. On account of the possibility of the presence of a brain abscess an exploration for brain abscess was done.

Operation, December 24, 1919. Drainage of brain abscess. Tegmen removed, dura incised, brain searcher introduced 1 cm. into cerebrum and several ounces of yellowish fluid were evacuated. This fluid was evidently cerebrospinal fluid; it was under pressure and contained streptococci. Searcher was then introduced anteriorly but no pus found. The searcher was now introduced into the cerebellum parallel to the posterior surface of the pars petrosa to a depth of 2 cm., but no pus found. In attempting to introduce a drain into the first

wound of the cerebrum there was a gush of pus of about an ounce from a cavity posterior and external to the first wound. A split rubber drain was inserted into this cavity.

Postoperative: On the following day the abscess cavity was irrigated with normal salt solution, which washed out pus and debris. Vertigo absent. The abscess cavity was irrigated for a period of ten days; on the tenth day the rubber drain was discontinued because the sinus entering the brain had closed; on the eleventh day, a remittent fever to 101° was noted, and patient complained of headache. As the fever and headache persisted, the sinus entering the abscess cavity was reopened on the fourteenth day, with the liberation of a small amount of pus, and a gutta serena drain inserted. On the sixteenth day patient complained of pains in right eye and headache, is apathetic and stuporous; marked right neuritis present; slight purulent drainage; Kernig marked and rigidity of neck; W. B. C. 22,800. On the seventeenth day death occurred.

Comment: This was a case of right acute suppurative otitis media and mastoiditis that developed a right sphenotemporal lobe abscess and a fatal septic meningitis. The case was under observation at the hospital from the onset. Mastoidectomy was done on the fifteenth day of illness because of the presence of a sympathetic meningitis and high fever. Immediate improvement was noted after the operation, viz., a marked reduction in temperature and meningitic symptoms for a period of ten days, although the patient still complained of headache. During this time the spinal fluid had not been examined. This should have been done, as this would have thrown light upon the true state of affairs and would have avoided being kept in a state of false security. On the tenth day a bilateral papillitis was observed, and this, together with the fact that the headaches were unrelieved and the febrile course was stationary, suggested the possibility of the presence of a brain abscess, so that a cranial exploration for brain abscess was done and a right temporosphenoidal lobe abscess drained on the twenty-fifth day of illness. An abscess in the right temporosphenoidal lobe does not give the focal signs—e. g., sensory or motor aphasia, especially anomia and amnesia, as does an abscess located in the left temporosphenoidal lobe in right handed in-

dividuals. As is well known, a very large abscess may be present in the former location without causing any focal signs, but some of the symptoms of increased intracranial pressure are found. In this case we had headache, bilateral papillitis and the symptoms of sympathetic meningitis, viz., spinal fluid findings and meningitic symptoms. Slow pulse, nausea or vomiting was absent. The question can be raised here, whether the brain abscess was present at the time of the mastoid operation ten days previously, or did it develop subsequently. The fact that there was present a sympathetic meningitis at the time of the mastoid operation is sufficient proof of the presence of the brain abscess at that time. The subject of drainage of a brain abscess is a very important one. On the tenth day, as the sinus entering the brain had closed, the rubber drainage tube was dispensed with. On the fourteenth day, on account of headache and rise in temperature, the sinus was reopened, with the liberation of some pus, and drainage provided. Along about this time a fatal meningitis set in which caused her death on the seventeenth day. Without repeated examinations of the spinal fluid it is difficult to estimate with any degree of exactness the time of onset of the meningitis. One of the lessons to be learned from this case is the necessity for frequent examinations of the spinal fluid; another is not to allow closure of the brain abscess sinus before three weeks, at least, have elapsed since initiating drainage; also, that the presence of a sympathetic meningitis means more than the presence of a mastoiditis. It signifies that there is also an intracranial complication present, and it demands further exploration to ascertain the nature of the intracranial complication.

Case 7.—B. A., age 9 years, admitted March 25, 1920, died April 20, 1920. Symptoms noted on admission: Coma, right facial paralysis, fever and purulent discharge from right ear. Onset and course: Had right chronic suppurative otitis media since infancy. Left ear has discharged slightly at times, but for past several weeks has been dry. About two weeks ago child began to complain of right earache, and discharge was more profuse. Four days ago child became worse, had fever and remained in bed. Yesterday mother noted facial paralysis, rigidity, retraction of neck, delirium and vomited several times. This morning child could not answer questions.

Examination: Temperature 102.3, pulse 92, respiration 24. Child is in coma, restless and grinds teeth occasionally. There is a peripheral right facial paralysis, an occasional spontaneous nystagmus; the right ear shows a profuse purulent fetid discharge, and the patient reacts when pressure is made over the mastoid; the left ear is negative except for a large scar in the posterior inferior quadrant. There is marked rigidity and retraction of the neck and spasticity of the lower extremities. Bilateral Kernig very marked; reflexes increased; W. B. C. 26,000. Spinal puncture done but no spinal fluid obtained.

Diagnosis: Otitic meningitis, chronic suppurative otitis media, with acute exacerbation and acute suppurative mastoiditis.

Operation: Right radical mastoidectomy with exploration of temporal lobe, March 25, 1920. Pathologic condition found: Right chronic otitis media suppurativa with cholesteatoma, suppurative mastoiditis and extradural abscess. Technic: Antrum opened, posterior wall of bony canal removed, cholesteatomatous material evacuated, malleus and incus removed. The sinus was normal, the dura over the tegmen discolored and partly covered by granulations and some pus encountered between the tegmen and dura. The dura was incised and the temporal lobe explored but no abscess found. Rubber drainage tube inserted through dural incision.

Postoperative: Immediately after operation there was noted slight tremor and muscular twitching of right arm, forearm and hand, and right divergent strabismus. On the first post-operative day patient was comatose and restless. On the fifth day the drainage tube was removed, and on the sixth day the temperature, pulse and respiration were normal and there was no retraction of the neck, and the patient did not respond to questions; the temperature remained normal for several days and discharge increased. On the thirteenth day a cerebral hernia about the size of a cherry was noted. On the twenty-first day the patient became stuporous and the spinal fluid showed a cell count of 120, globulin present and no organisms on smear and culture. On the twenty-fourth day, as the herniation had increased perceptibly during the past week, a needle was inserted into the hernia but no pus obtained. On the twenty-

sixth day it was noted that the patient had vomited several times the day before and that, together with the increase in temperature and increase in size of the hernia, suggested increased intracranial pressure due to abscess. A thorough probing and search for brain abscess failed to reveal pus. Patient had a convulsion, followed by stopping of respiration, cyanosis and death. The heart continued to beat strongly for three minutes after respiration had ceased.

Anatomic diagnosis: Abscess of the right lobe of the cerebellum, localized purulent basilar leptomeningitis, herniation of right temporal lobe of brain, purulent osteomyelitis of the petrous portion of the right temporal bone, thrombosis of the right lateral sinus, right mastoiditis and bilateral purulent otitis media.

Comment: This was a case of right chronic suppurative otitis media and mastoiditis, with acute exacerbation of right facial and oculomotor nerve paralysis, extradural abscess, sinus thrombosis and cerebellar abscess. An examination of the spinal fluid should have been done before operation. A lumbar puncture with a "dry tap" should be considered a failure to obtain the spinal fluid, which is present in over 99 per cent of the cases. Another attempt to obtain spinal fluid was not made until 20 days later, when the spinal fluid showed 120 cells, globulin positive and a sterile fluid, signs of a sympathetic meningitis due to the presence of a brain abscess, as an extradural abscess could now be definitely excluded. A slow pulse was conspicuously absent, in fact, it was just the opposite—e. g., with a temperature of 98.8, the pulse was 90. When abscess of the cerebrum had been excluded and abscess of the cerebellum had not been excluded at operation, the latter should have been considered and the vestibular tests made, especially in view of the fact that even before operation the presence of a spontaneous nystagmus was noted. As cerebellar signs are characterized by being hemolateral and affect the side of the lesion, did not the involvement of the third, seventh and eighth nerve, together with muscular switching of the right upper extremity, suggest a cerebellar lesion? In case of doubt, the cerebellum should have been explored for abscess. The fundus findings remained continuously negative. The aphasia was toxic in

nature and was due to the encephalitis and not to involvement of the cerebral centers by the abscess. The usual improvement after the drainage of a suppurative mastoiditis was present in this case, which is so deceptive in the presence of an intracranial complication. However, the subsequent course should have suggested the diagnosis.

When exploring for brain abscess, herniation can be prevented by puncture through the intact dura, as then the cerebrum cannot herniate as it did through the incised dura. This can be done successfully, regardless of the amount of bone removed from the floor of the cerebral fossa. This case also calls attention to the fact that the brain can be explored for brain abscess through an infected field without producing a brain abscess where none was present or resulting in the production of a diffuse septic meningitis. The necropsy showed a localized meningitis in the immediate neighborhood of the cerebellar abscess, which is clinically designated a sympathetic meningitis.

Case 8.—B. A., male, age 40 years, admitted November 30, 1917. Complaint: Left earache, swelling and tenderness in front of left ear. Onset and course: For past 16 years has had chronic suppurative otitis media and for the last three or four days has had pain and swelling in front of the left ear.

Examination shows temperature 97.8, pulse 72 and respiration 24. Mentality is dull, answers questions slowly and with impediment of speech, at times being unable to say what he evidently wishes to say. Left ear drum is dull but ear is not discharging. There is swelling and tenderness anterior to left ear. Spinal fluid clear, pressure normal, cells 8. W. B. C. 13,600.

Diagnosis: Left otitis media and zygomatic mastoiditis, with left temporosphenoidal lobe abscess.

Operation, December 1, 1917. After pulse and temperature ratio was noted as 60—97.4. Left mastoidectomy with drainage of an extradural abscess and a left temporosphenoidal lobe abscess. Pus was found in the zygomatic cells.

Postoperative: The following day patient was stuporous; the temperature varied from normal to 100 and the pulse from 72 to 96. On the second day the temperature became normal and the pulse as low as 60, and from then on until the eighth

day, when he died, the temperature was practically normal and the pulse varied from 56 to 66. The day he died his temperature reached 104.6 and the pulse 138.

Anatomic diagnosis: Left chronic otitis media suppurativa and mastoiditis, solitary abscess in the left temporosphenoidal lobe, passive hyperemia of the pia arachnoid vessels. (Cultures of the pus obtained from the brain abscess yield streptococcus hemolyticus.)

Comment: This was a case of left chronic otitis media suppurativa and mastoiditis, with extradural and left temporosphenoidal lobe abscess. The distinguishing feature of this case was the apparent lack of reaction on the part of the meninges. Therefore, the signs and symptoms of sympathetic meningitis were absent—i. e., the spinal fluid was normal and no meningitic symptoms were present. The diagnosis of otitic temporal lobe abscess was made on the presence of anomia and bradycardia and the presence of a normal or subnormal temperature. The operative drainage was insufficient, as shown by the reappearance of bradycardia, a marked sign in this case of increased intracranial pressure.

Case 9.—B. A., female, age 15 years, admitted January 31, 1916. Complaint: Headache, vomiting and loss of vision. Onset and course: About three months ago she began to have headaches, the attacks occurring once or twice a week, lasting one or two days. They were severe and almost blinding, situated in the frontal region; at the height of the attack the patient usually vomited; the vomiting bore no relation to food. Since last week her vision has been decreasing. Previous history: Had scarlet fever last summer and earache five months ago.

Examination: Temperature 98, pulse 72, respiration 20; ear and nose negative. Eyes show slight spontaneous nystagmus to the right. There is slight rigidity of the neck and slight Brudzinski. Fundus shows marked hyperemia and swelling of both discs, with obliteration of the margins and whitish streaks radiating out from the discs, with white patches where the vessels dip in about the site of the disc. The spinal fluid was clear, under very high pressure, with 28 cells per cmm. (14 per cent polymorphonuclears and 80 per cent mononuclears), globulin positive. No organisms found. W. B. C. 24,150.

January 31, 1916. Temperature varied from 98 to 101 and pulse from 72 to 96. Complains of severe headache.

February 1, 1916. There is excessive swelling of discs, 3 to 4 mm., with peripheral hemorrhages. Discs are much enlarged due to the choked discs; veins are enlarged and tortuous. Leber spots in the macula and an engrafted secondary optic neuritis are present. Temperature 99 to 100.8 and pulse 84 to 96. Complains of severe headache.

February 2, 1916. Spinal fluid clear, under increased pressure, 40 cells per cmm., globulin present and sterile. Temperature 98.4 to 100.4 and pulse 94 to 96.

February 4, 1916. Temperature 98 to 100.6 and pulse 80 to 108. Vision, O. D. 15/30, O. S. 15/30. Fresh hemorrhages noted in fundi; swelling higher than before.

February 5, 1916. Temperature 98.8 to 102.2 and pulse 86 to 120.

Diagnosis: Brain tumor (by the neurologist). Was to be operated on the next morning, but patient died at midnight on the sixth day after admittance.

Necropsy showed abscess of the left occipital lobe of the brain and a suppurative basilar meningitis.

Case 10.—B. A., male, age 37 years, admitted into the hospital on account of a chronic suppurative dacryocystitis, and while in the ward developed a left acute suppurative otitis media and mastoiditis which subsided.

Examination, January 26, 1915. After he had a chill his temperature arose to 105; W. B. C. 18,000; no discharge from ears or mastoid tenderness present. Spinal fluid was slightly cloudy, cells 372, 25 per cent polymorphonuclears and 75 per cent mononuclears; globulin positive.

January 27, 1915. Complains of frontal and temporal headache. The left ear is discharging.

February 2, 1915. Temperature 99.4 and pulse 74. A thin stinking discharge was found from left ear. No pain or tenderness over the mastoid. No Kernig or rigidity of the neck.

Diagnosis: Chronic suppurative otitis media.

February 17, 1915. He developed pulmonary edema and died. Previous to this it was noted that his mental condition was poor and a brain abscess was suspected.

Anatomic diagnosis: Left temporal lobe abscess of the brain, fibrinopurulent meningitis, bilateral suppurative otitis media.

Case 11.—B. A., admitted April 7, 1915. History: Onset 13 days ago with chill and fever. The next day the right ear began to ache, and the drum membrane was lanced, since which the ear has been discharging. Two days ago his left forearm became red, swollen and painful, and yesterday the right ankle, left wrist and thumb joints became involved.

Examination: Temperature 100.2, pulse 100, respiration 28. Right ear discharging pus, arthritis of left elbow, wrist and finger joints and right ankle.

April 19, 1915. Left shoulder, both wrists and carpal joints swollen, red and painful; left knee jerk exaggerated and left ankle clonus present.

April 22, 1915. Temperature 100.4, pulse 124, respiration 24. Complains of pain over right occiput; no mastoid tenderness or tenderness in the neck along the internal jugular; ear discharging profusely. Radiogram of right mastoid shows mastoid cloudy with markings indistinct, indicating pathologic involvement. W. B. C. 12,000. Spinal puncture shows 23 cells per cmm. and Wassermann 4+. Pupils unequal, ptosis of right eyelid.

Diagnosis: Acute suppurative otitis media and mastoiditis, septic arthritis, sinus thrombosis and brain abscess.

April 27, 1915. Operation. Simple mastoidectomy.

May 1, 1915. Had severe chill of 30 minutes' duration. Right pupil is smaller, which, together with narrowing of the palpebral fissure and enophthalmus, shows involvement of the right cervical sympathetic nerve.

May 3, 1915. Patient is stuporous. Nystagmus was observed to the opposite side and 15 minutes later toward the side of the lesion.

May 4, 1915. Had a chill lasting 10 minutes.

May 8, 1915. Had a severe chill, followed by a temperature of 100.

May 9, 1915. Operation: Thrombosis of right lateral sinus. The thrombus was evacuated. The internal jugular vein was ligated.

May 10, 1915. Delirious. There is a marked tremor of the hands, lips and tongue and spasticity of the arms.

May 11, 1915. Died.

Anatomic diagnosis: Right otitis media suppurativa, suppurating right mastoidectomy wound, suppurative osteomyelitis of the petrous portion of the temporal bone, lateral sinus thrombosis, suppurative softening of the base of the brain at the right cerebellopontine angle. Catgut ligature on the right lingual artery.

Comment: This was a case of acute otitis media suppurativa and mastoiditis, sinus thrombosis and cerebellar abscess. The patient evidently entered the hospital with a sinus thrombosis, as a septic arthritis was present two days previously, which was the eleventh day of illness. In spite of the absence of local evidence of mastoid involvement, the diagnosis should have been suspected and the mastoid explored for evidence of sinus phlebitis and thrombosis, but operation was not done until the twentieth day of residence in the hospital, at which time the sinus was not opened. The patient continued to have chills, and 12 days after the first operation and on the thirty-second day of residence in the hospital, the mastoid was reopened and the lateral sinus was found to contain a thrombus. This operation was too long delayed and should have been done at least one month before. Only one lumbar puncture was done, and that on the fifteenth day after entering the hospital, but this should have suggested some otitic intracranial involvement, if cerebrospinal lues could be eliminated. The occurrence of a spontaneous nystagmus should always suggest the presence of either a labyrinthitis or a cerebellar abscess. The etiology of Horner's syndrome showing a paralysis of the cervical sympathetic is extremely vague in this case.

Case 12.—B. A., admitted February 3, 1914, male, age 16 years. Present complaint, severe headache, discharge from right ear and earache. Onset and course: Earache and discharge beginning eight months ago. Headache has been present for past two or three weeks, which was severe and constant, and located over the right frontoparietal region.

Examination: Temperature 97, pulse 44, respiration 24. There is discharge from the right ear, rigidity of neck and

positive Kernig. Fundi show neuroretinitis exudativa and choked discs. W. B. C. 16,400. Spinal fluid was under increased pressure, with 370 cells per cmm. For three days, the temperature was slightly subnormal and the pulse varied from 50 to 84.

February 5, 1914. Operation: Radical mastoid and exploration of the cerebrum. A fistula was found that extended from the posterior part of the mastoid inward and backward to an extradural abscess. A scalpel was passed in several directions into the brain without getting any pus.

Postoperative: For 12 days the temperature was slightly subnormal or slightly above normal, with a pulse running from 48 to 60. Patient died on the thirteenth postoperative day in coma, with twitching and jerking of right side of body.

Anatomic diagnosis: Right chronic purulent otitis media, right mastoidectomy operative wound, seropurulent cerebrospinal meningitis, solitary abscess of the right temporal lobe of the brain.

Case 13.—B. A., male, age 47 years, admitted October 17, 1915. Patient was brought to the hospital in coma. His wife gave the following history: Onset two months ago with right earache, with severe headaches ever since. Right ear began to discharge one month ago. Commenced to feel drowsy four days ago; vomiting three days ago, projectile in type. Headaches became aggravated. Had severe chill today and high fever and became unconscious.

Examination shows patient in coma with marked cyanosis and dyspnea; temperature 105, pulse 100, respiration 22. Pupils are dilated, right ear discharging pus, drum membrane absent. There is complete relaxation of all the muscles of the body and reflexes are absent. W. B. C. 21,200. Spinal fluid shows an increased pressure, turbid yellow, 44,400 cells per cmm., and stained smear reveals extracellular diplococci.

Diagnosis: Otitic meningitis and chronic otitis media suppurativa.

Anatomic diagnosis: Abscess of the right temporal lobe of the brain, necrosis of the dura of the right temporal lobe, right purulent otitis media with missing tympanic membrane and middle ear ossicles.

Case 14.—B. A., admitted September 15, 1916, age 22 months, male. Present complaint: Convulsions, diarrhea and vomiting. Onset and course: Child had convulsions three days ago, followed by another convulsion the next day, since which he has had frequent watery yellow stools and occasional vomiting.

Examination: Slight discharge from right ear and slight tenderness over mastoid. Temperature 101. W. B. C. 10,150.

Diagnosis: Gastroenteritis and otitis media suppurativa.

Clinical course: The temperature varied from 102.6 to 105 until the child died, 23 days after admittance. The child became stuporous and had convulsions several times. The reflexes were diminished on the right side and later became normal. Spinal fluid was examined four different times; it was always cloudy, pressure was increased, cells increased, 65 per cmm., globulin positive; cells were mostly lymphocytes and fluid sterile. A week before death the child developed rigidity of the neck, positive Brudzinski and spastic paralysis of the left arm and leg.

Anatomic diagnosis: Right purulent otitis media, purulent leptomeningitis, abscess of the left occipital lobe, moderate edema of the brain, hyperemia of the pia arachnoid vessels over the cerebral cortex.

Case 15.—A. O. M., male, age 13 years, admitted August 26, 1917, with the following history: Four years ago he had a right mastoidectomy in this hospital, since which he has had a persistently discharging sinus in the mastoid bone which is still present. He has been well until a week ago, when he became irrational.

Examination: Temperature 105.8, pulse 108, respiration 32. Right ear discharges a small amount of seropurulent material; also right mastoid sinus. Patient cries out when pressure is made over the right mastoid. Rigidity of the neck is present, Kernig positive, and Babinski and Oppenheim bilaterally positive. Spinal fluid was under increased pressure, cloudy, 2,960 cells per cmm., globulin positive, and smear shows Gram positive cocci but culture was sterile. W. B. C. 9,200. Patient died on the day of admittance to the hospital.

Anatomic diagnosis: Right chronic suppurative otitis media and mastoiditis, right sigmoid sinus thrombosis, abscess of the cerebellum, acute purulent leptomeningitis, marked hyperemia of the leptomeninges, marked edema of the brain and foramen magnum pressure, furrow of the brain stem.

Case 16.—A. M., male, age 45 years, admitted June 4, 1915. Patient was transferred from the medical ward, where he had been under treatment on account of lobar pneumonia. On May 20, 1915, a discharge was noted from the right ear and three days later from both ears. On June 4, 1915, patient complained of severe pain in left side of head and tenderness over the tip of the mastoid and pain on percussion over left parietal region. Infiltration is present over the left mastoid. Some rigidity of the neck, double Kernig and increased knee jerks are present.

Operation, June 5, 1915: Simple mastoidectomy. Surgical pathology present; suppurative mastoiditis. Sinus was normal.

Postoperative: Patient complained occasionally of headaches; nine days later the discharge was offensive and profuse; 15 days later, patient's mentality was clouded; 20 days later, talked irrationally; on the twenty-third day, complained of headache, and on the twenty-sixth day was stuporous; on the twenty-seventh day he vomited several times and had some rigidity of the neck and Kernig. On the twenty-eighth day he died. The spinal puncture showed increased pressure, cloudy, 2,160 cells, mostly polymorphonuclears, and fluid sterile. Bilateral Babinski, Kernig and Brudzinski were positive; the neck was markedly rigid and the patellar jerks were very brisk.

Anatomic diagnosis: Abscess of the left temporosphenoidal lobe in contiguity with subdural and extradural abscess arising from suppurative left otitis media and mastoiditis, healing operative incision of left mastoid, abscess of left mastoid cells, granulation tissue in wall of left lateral sinus, acute nonexudative diffuse leptomeningitis.

Comment.—This case again shows the value of an early examination of the spinal fluid in any otitic case suspected of having any intracranial complication. The patient had been under observation for 29 days before he died, but the spinal fluid was not examined until the twenty-eighth day. It also

emphasizes the necessity of further investigations and surgical exploration after a mastoidectomy has been done and the patient does not improve or gets worse.

Case 17.—B. A., male, age 37 years, admitted November 18, 1918. It was impossible to obtain any history. Patient had influenza and developed mastoiditis and had a mastoidectomy performed recently.

Examination shows patient in a lethargic state with temperature 98, pulse 76 and respiration 26. There is a recent scar over the left mastoid and tenderness is present but no other sign of active infection.

Clinical course: On November 29, 1918, the patient developed a temperature without demonstrable findings. Temperature 103.4, pulse 88 and respiration 24. After three days of fever with a markedly slow pulse in proportion, the temperature became subnormal, with the pulse around 50, and so continued until the patient died, on the twenty-eighth day of his residence in the hospital. On December 4, 1918, a radiogram of the head for brain abscess was made. The report showed involvement of the left mastoid but no signs of brain abscess. The patient had become more stuporous and was having involuntaries. On December 8, 1918 (the twentieth day of hospital residence) a spinal puncture was done. The spinal fluid was clear, albumin and globulin present, with 10 cells per cmm., all cells lymphocytes. W. B. C. 8,200, 68 per cent polymorphonuclears; red blood cells, 4,880,000; hemoglobin, 65 per cent.

Diagnosis: Brain abscess, but owing to poor condition operation was not considered indicated.

Anatomic diagnosis: Left suppurative otitis media and mastoiditis, septic thrombosis of the left lateral sinus, erosion of the petrous portion of the left temporal bone, multiple massive abscesses of the temporal and occipital lobes of the left hemisphere, with erosion of abscess through the brain substance into the inferior horn of the left lateral ventricle, empyema of the lateral ventricles, the third and fourth ventricles of the brain, marked hyperemia and edema of the brain and metastatic abscess in the left sternoclavicular joint. The organisms isolated from the pus taken from the brain abscess at autopsy were identified as hemolytic streptococci.

Comment: The patient entered the hospital in a lethargic state with the history of having had a recent mastoidectomy. This should have suggested the probability of the presence of a brain abscess requiring a spinal puncture, which was not done until 20 days later. The spinal fluid showed a practically normal cell count, which shows that a brain abscess may be present, in some cases, without a defensive reaction occurring in the cellular elements of the cerebrospinal fluid. Coincidentally, practically the same thing occurred in the blood.

This case typifies the association in brain abscess of a sub-normal temperature with a marked bradycardia. The pulse reached as low as 48, nine days before he died. The case is remarkable for the absence of fever in the presence of so much suppurative pathology; especially is this true of sinus thrombosis, in which we expect to find a septic temperature.

Case 18.—B. A., admitted December 13, 1920, with the history of right earache and headache of 12 days' duration. Two or three days later the ear began to discharge a thin, watery sanguinous pus, which has been present since. The headache has been dull and constant. Patient states that he has never had any ear trouble previously.

The essential physical findings are the right ear discharge and large pulsating perforation in the posterior part of the drum. The posterior superior wall does not sag, and there is no infiltration or tenderness over the mastoid. Rigidity of the neck is marked and Kernig positive. Spinal fluid under pressure, turbid, 3,000 cells per cmm., mostly polymorphonuclears, and fluid sterile. Radiograph shows no definite cell markings in right mastoid indicating mastoid involvement. Temperature 102.6, pulse 104 and respiration 22.

Diagnosis: Acute suppurative otitis media and mastoiditis (right) and secondary septic meningitis.

Operation, December 14, 1920: Simple mastoid operation. Mastoid abscess present; dura of middle fossa normal; bone over sinus normal. Temperature 102.6, pulse 84.

Postoperative: First day, temperature 100.2, pulse 68, respiration 20. No headache.

Second day, temperature 98.6, pulse 72, respiration 20. Spinal puncture shows increased pressure, 285 cells, globulin

positive. Afternoon rise in temperature to 100.2, pulse 68, respiration 20.

Third day, temperature from 98.8 to 100.2 and pulse from 64 to 66. W. B. C. 12,600.

Fourth day, temperature normal, pulse 56 to 72; no rigidity of neck present.

Fifth and sixth days, temperature from 98 to 100 and pulse from 60 to 64. Pulse has been showing a decided tendency to bradycardia and patient is drowsy.

Seventh day, temperature normal, pulse 68, respiration 20. More drowsy. W. B. C. 12,400, 72 per cent polymorphonuclears. No rigidity of neck or Kernig present. Spinal fluid 250 cells.

Eighth day, patient is more stuporous and cannot be aroused. Condition much worse; temperature 98.6, pulse 60, respiration 20.

Operation: Exploration for brain abscess. The dura in the middle and posterior fossa were exposed; exploratory needle puncture for pus was negative; the dura was then incised crucially and brain searcher introduced in various directions with negative results.

Postoperative: First day, temperature from 100 to 104, pulse from 56 to 156, respiration from 20 to 54. Had Cheyne-Stokes respiration last night but is normal again. Neck is very rigid. Herniation of brain increased.

Second day, temperature 103, pulse 152, respiration 40. Cheyne-Stokes respiration present again; has developed a left hemiparesis; drainage is very poor; still in coma; spinal fluid shows fluid clear, normal pressure and 80 cells per cmm.

Third day, temperature 104.6, pulse 80, respiration 60. Patient died.

Anatomic diagnosis: Acute otitis media suppurativa and mastoiditis (right), osteomyelitis of right mastoid process and temporal bone, abscess of the right temporal lobe of the brain, hyperemia of the leptomeninges, suppurative sphenoiditis.

Comment: At the mastoid operation performed the day after admittance no cause for the presence of a sympathetic meningitis was found extradurally. Therefore, the operation should not have been stopped here, but should have been fol-

lowed up by an intradural exploration. This was not done until eight days later. The usual improvement occurring after the drainage of a suppurative mastoiditis was present in this case and again proved deceptive. There was a marked reduction in the temperature, ranging from normal to 100; the headache, rigidity of the neck and Kernig disappeared, the spinal cell count was reduced from 3,000 to 285 on the second postoperative day and remained in this neighborhood up to the seventh day (250 cells). The persistent presence of a marked increase in the spinal fluid cell count signified the continued presence of meningeal irritation, regardless of the absence of the two most important clinical signs of a sympathetic meningitis, rigid neck and Kernig, and of a marked reduction in the spinal fluid cell count. The appearance of a bradycardia and the persistence of the same, lasting as it did until just before death, should call attention to the fact that the intracranial pressure was still unrelieved by operation. And this was especially so because of the early and marked retardation of the pulse rate—e. g., on the fourth day the pulse was recorded 56. Associated with the slow pulse was stupor, which appeared about the fifth day. When due to long continued increase of intracranial pressure, it is a late symptom; when due to toxic encephalitis, it is an early symptom. This case demonstrates the fact that a brain abscess may be present and that, even after a thorough exploration, it may not be found.

CONCLUSIONS.

Many important lessons can be learned from a study of these case histories. First and foremost is the fact that we must thoroughly investigate our cases, in a systematic and accurate manner, as early as possible. To procrastinate is fatal, as successful treatment depends primarily upon an early diagnosis. There is no doubt that in some cases a preoperative correct diagnosis may be difficult or indeed impossible of attainment, even though we are most thorough and use all of the diagnostic methods we possess. Fortunately, these cases belong to a minor group and consist of unusual and atypical cases or neglected cases in which multiple complications are present. These cases seem to controvert all the recognized rules acquired by experience and scientific study. It must have been of these

cases that Hippocrates had in mind when he formulated his well known and often quoted aphorism, "Experience is fallacious and judgment difficult."

Let us recognize some of the fundamental diagnostic principles that are so essential to a successful diagnosis of otitic intracranial complications. There is no single sign or symptom that we should depend upon exclusively in making a diagnosis, but rather upon the whole clinical picture. In some cases of otitic suppuration, a successful diagnosis of brain abscess has been made on the presence of one very important sign, as a markedly slow pulse, or anomia, or a sympathetic meningitis, but it would be more reassuring to have a bradycardia or an anomia reenforced by the signs and symptoms of a sympathetic meningitis. The most necessary procedure in these cases is an early examination of the spinal fluid, because it is the spinal fluid that is most frequently and earliest affected. We are indeed fortunate to have in the spinal fluid a very sensitive indicator of meningeal irritation. In an analysis of the cell count of 17 cases of otitic brain abscess in which the diagnosis was confirmed either by operation or necropsy, I found that there was an increase in cells to 100 in 35 per cent, to 500 in 60 per cent, to 5,000 in 80 per cent, and 20 per cent had a cell count over 10,000. The cases in which the cell count was over 10,000 were complicated by diffuse septic meningitis. Two cases showed a normal cell count (eight and ten cells). A sympathetic meningitis is characterized by the presence of (1) meningitic symptoms, as neck rigidity, Kernig, Brudzinski, etc., and (2) a sterile spinal fluid, with increased cell count, usually ranging from 25 to 5,000 cells, the polymorphonuclear predominating. "The presence, and especially the persistence, of a sympathetic meningitis, when there is an associated otitic infection, in the absence of an extradural abscess, denotes the presence of some intradural suppuration as subdural, cerebral or cerebellar abscess, and calls for an immediate operative exploration of the middle or posterior cranial fossa."¹ The symptoms and signs of sympathetic meningitis may be absent, yet the presence of an increased count of the spinal fluid may be just as significant; when either of these is associated with signs of increased intracranial pressure, as choked disc, slow pulse or stupor, the diagnosis is almost certain.

An intradural suppuration gives a more marked cellular reaction of the spinal fluid than an extradural suppuration. No matter how much pus is contained in the mastoid cells and middle ear, the spinal fluid cell count will be unaffected. The same is true of sinus thrombosis unassociated with a perisinus abscess. But if there is an extradural abscess it will give to the spinal fluid, usually, the findings of a sympathetic meningitis, but the reaction is not as severe as occurs in the presence of some intradural suppuration. I have seen an extensive extradural abscess walled off by a thick layer of edematous granulations, without causing any change in the cell count of the spinal fluid (4 cells per cmm.). This may occur in brain abscess also, but it is the exception. A cell count of a sympathetic meningitis may be present in the early stage of a brain abscess and suddenly rise beyond the limits of a sympathetic meningitis, as in Case 2, from 60 cells to 56,000 cells. This means only one thing—i. e., a circumscribed meningitis has become a diffuse septic meningitis.

Of the 13 cases of otitic brain abscess in which necropsy was performed, 100 per cent showed a suppurative otitis media, of which 23 per cent were acute and 77 per cent chronic; mastoiditis was associated in 46 per cent; 61 per cent had associated meningitis; 30 per cent, sinus thrombosis; 8 per cent, extradural abscess, and 8 per cent, subdural abscess; 90 per cent had multiple complications.

Of the 18 otitic brain abscesses reported above, two-thirds were cerebral and one-third were cerebellar; of the cerebral abscesses, 83 per cent were temporosphenoidal and 17 per cent occipital.

Brain abscess ranks third in point of frequency as an intracranial complication of suppurative middle ear disease. It was exceeded by meningitis and sinus thrombosis, meningitis occurring in 5 per cent, sinus thrombosis in 2.7 per cent and brain abscess in 1.5 per cent. The total number of brain abscesses due to all causes (trauma, pulmonary disease, accessory nasal sinus disease and middle ear suppuration) was 64 cases; 23 cases, or 36 per cent, were otitic brain abscesses.

Of the 18 cases of otitic brain abscess herewith reported, 12 were operated upon and but one recovered, a mortality of 91 per cent. The high mortality rate in brain abscess cases is

usually due to delay in adequately draining the abscess. One obstacle to a reduction of the high mortality of these cases is (1) the moribund condition of the patient when he enters the hospital, and (2) the procrastinating in the diagnosis of brain abscess until the patient is practically moribund. In either case it is useless to operate and expect a successful result. Surgical drainage of a brain abscess must be done as soon as the diagnosis can be established, and this done early, in order to be of any service to the patient.

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XLI.

STREPTOCOCCUS MUCOSUS AS AN ETIOLOGIC
FACTOR IN OTITIS MEDIA AND MASTOIDITIS.

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Among all the etiologic factors in middle ear affections, the otitis caused by the streptococcus mucosus demands an especially prominent position. The entire disease process, from the onset of the infection up to the appearance of recognizable clinical symptoms, is fundamentally different from the infection of the middle ear caused by the streptococcus pyogenes, staphylococcus, etc. A knowledge of its characteristic clinical manifestations is of great importance to the otologist, inasmuch as this form of infection is not rare, and its early recognition will avoid serious and often fatal complications.

In an attempt to find a bacteriologic relationship between otitis media and mastoiditis, Neumann and Ruttin,¹ in 1907, made examinations of the exudate from the tympanic cavities of 89 cases of acute otitis media. These authors found the streptococcus mucosus in 8 cases, or 8.9 per cent. These authors were the first to describe definitely and clearly its clinical course. They call attention to the rapid healing of the inflammatory process in the tympanic cavity, with the later onset of a mastoiditis or intracranial complication, after a variable latent period. In a second series of 90 cases by the same observers,² in which pus from the mastoid was bacteriologically

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†Read before the New Haven Medical Society, New Haven, Connecticut, March 5th, 1924.

examined, the streptococcus mucosus was found in 6 cases, or 6.6 per cent. Subsequently Zytowitsch,³ in 1912, corroborated the clinical and bacteriologic findings of Neumann and Ruttin. Perkins,⁴ in 1914, reported seven cases of aural infection with the streptococcus mucosus. Supfle,⁵ in 1906, reported the bacteriologic findings in 45 cases of otitis media, in which the mucosus was present in 6 cases, or 13.3 per cent. Kümme!,⁶ in 1907, made similar bacteriologic studies of 142 cases of otitis media, and found the streptococcus mucosus in 16 cases, or 11.2 per cent. Beck⁷ of Heidelberg observed 200 cases of otitis media, 3 per cent of which were due to the streptococcus mucosus.

The frequency of this form of infection prompted us to make a thorough study of the case histories of patients admitted into the otologic service of this clinic during 1921 and 1922, the cases occurring during the latter half of 1922 being under our personal observation. Of 1,078 admissions during the above mentioned period, 491 patients came to operation, of which 57 cases, or 11.6 per cent, were due to streptococcus mucosus infection.

A careful analysis of these 57 cases elicited the following data:

Age Incidence.—The largest number of cases, 30, occurred between the ages of 40 and 60 years. The youngest patient operated upon was 6 months and the oldest was 72 years of age.

Sex.—Forty-one of the patients were males and 16 were females.

Previous Infection.—Seventeen of the patients gave a previous history of influenza, 5 of acute rhinitis and in the remaining cases we were unable to obtain any related history.

Seasonal Occurrence.—Twenty-eight of the cases occurred during the months of January, February and March, while the remaining 29 cases were evenly distributed among the remaining months.

Clinical Course.—In the study of these 57 cases, we found that their manifestations could be divided into four groups.

Group I.—Cases in which there is no relationship between the subjective and objective findings on the one hand and the

course of the disease on the other. Here, there is no spontaneous perforation, slight or no discharge after paracentesis, slight changes in the tympanic membrane, mild functional disturbance, etc. Then a variable interval of quiescence occurs, to be followed by serious and often fatal complications. This group represents the cases of typical infection with the mucosus organism, and is the type which most often escapes recognition.

Group II.—Cases in which there are slight subjective and objective findings, with slight discharge after spontaneous perforation or paracentesis, of very short duration. There is then apparent healing, only to be followed by the same course as in Group I.

Group III.—Cases with onset as seen in the acute otitis media of streptococcus pyogenes, lasting one to three weeks, then apparent healing, to be followed by complications occurring weeks and months later. Close attention to difficulty of hearing, noises, headache and tympanic membrane picture is very important in this group.

Group IV.—Cases whose course is similar to the ordinary streptococcus pyogenes otitis media, and finding of the mucosus organism in the pus from the middle ear or mastoid.

ANALYSIS OF GROUPS.

Group I.—In order to understand the clinical course of these four different groups, it is necessary to have always the typical course of Group I cases in the foreground. The usual route of infection is through the eustachian tube. The organism grows into the mucous membrane and produces inflammation without the formation of free pus, or, if at all, it is small in amount. This inflammatory process is not an active one, so that its presence is not manifested by the acute symptomatology of a streptococcus pyogenes otitis. Therefore, we do not have marked infiltration, neuritis or pressure of exudate. A negative history of pain or only of a slightly sticking nature is characteristic. The patient complains of a feeling of fullness in the ear or a "consciousness of organ" feeling. The nature of the complaint is undefined, although the patient states that something is not quite right in his ear. (Headache may be an important symptom, especially in the elderly. The function of

hearing is markedly disturbed, conversation voice being reduced to below one meter, and its association with troublesome noises may be the only symptoms complained of. A pounding feeling in the ear is also described by some patients. Because of the mildly active process of the mucosus in the tympanic cavity there is a corresponding lack of well defined changes in the drum membrane. There is an early loss of transparency, the light reflex disappears, the color is grayish red, the short process and the manubrium are indistinctly visible, and localized bulging or retraction may be observed.

There exists a great discrepancy between the clinical picture and the destruction by the organism. The whole picture can be ephemeral and the symptoms may be extraordinarily mild. In the analysis of such a picture, the subjective and objective findings would incline one to interpret it as a secretory or mucous catarrh. When, however, we proceed with the usual treatment for a catarrhal condition we find that the results are nil. We then suspect the presence of thick mucus in the tympanic cavity, but paracentesis yields no secretion or only a few drops of a mucoid or mucopurulent secretion; but the same clinical picture remains. Repeated paracenteses give the same negative results. This condition continues as such, with no variation for weeks and months, until the patient presents himself with symptoms of a mastoiditis or intracranial complication.

The latent period is characterized by the grayish red color of the drum membrane, loss of transparency, clouding of short process and hammer, and "consciousness of organ feeling." (The marked diminution of hearing, nearly always less than $\frac{1}{2}$ meter, for conversation voice, and the unbearable noises are two of the most characteristic findings during this latent state.) The lack of improvement after inflation of the middle ear also points in this direction. The occurrence of headache in an elderly individual with a suspicious picture of catarrh of the middle ear of long duration should incline us to do a lumbar puncture. Often we will find the white cells increased, or even the spinal fluid may be cloudy or purulent. Such a finding explains the "foudroyante" onset of meningitis in patients who have been quite well an hour or so before, in

which cases a lumbar puncture gives purulent fluid. It is clear that in such cases the meningitis must have existed for some time. It is during this latent period of the infection that we should operate in order to avoid the complications.

When the bacteriology of acute otitis media was studied by Neumann and Ruttin,² it was observed that some of these cases cleared up with remarkable rapidity, after a period of one to two weeks; and after an interval of several months of good health the same patients reappeared with mastoiditis or an intracranial complication. Bacteriologic examination in these cases gave positive culture of streptococcus mucosus.

An infiltrative form of tuberculosis of the tympanic cavity may simulate a streptococcus mucosus infection, as described by O. Beck⁸ and Neumann⁹; but pathologic examination of granulation tissue on the tympanic membrane will establish the diagnosis.

To us the many so-called cases of primary mastoiditis of former days were due to the mucosus organism, with the exception of those due to a tuberculous or luetic infection.

The interval between the onset of the infection and the complication is variable. In our series of cases the shortest period was 13 days and the longest was 165 days. The average period was approximately 51 days. Many reported cases have shown an interval of over a year. (Neumann—personal communication.) Therefore, a careful observation of suspected cases must last over a very long time until we can exclude with certainty the presence of this infection. In some of the cases the patient had chronic middle ear discharge for many years, ultimately developing mastoiditis with positive culture of mucosus. It was impossible in these cases to state definitely when the mucosus process began. Therefore, we cannot properly speak of an acute or chronic form of mucosus otitis, simply of a mucosus otitis.

Such a clinical picture detailed above, in contrast to the streptococcus pyogenes, can be graphically represented thus:

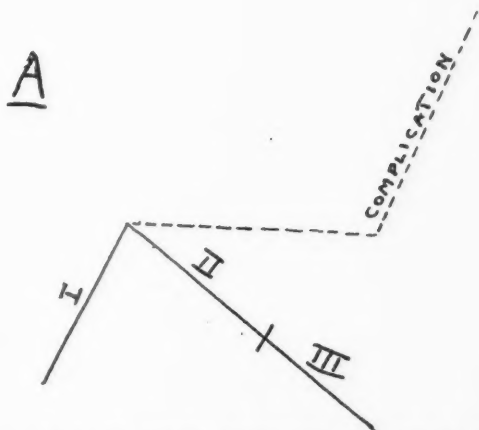


Chart A.—In the typical streptococcus pyogenes infection we recognize three stages in the progress of the inflammation. Stage I is the period of pain and acute inflammation, continuing up to spontaneous rupture or paracentesis, usually lasting four to seven days. The successive stages are characterized by mucoid, mucopurulent or purulent, then mucoid discharge, with gradual decline of inflammation with healing, the average duration of the process, in uncomplicated cases, lasting about four to five weeks. However, if a complication is developing there is a decided progress in the intensity of the inflammation up to the onset of the complication.

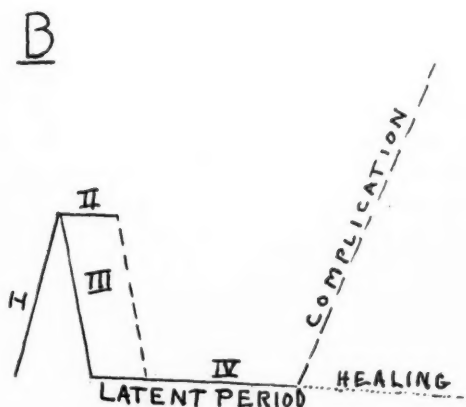


Chart B.—The mucosus chart, on the other hand, gives us a distinctly different picture. Stage I is mild in character, lasting from a few hours to a few days, and not associated with the acute symptomatology of a streptococcus pyogenes infection. Stage II corresponds to those cases where there may be slight mucoid or mucopurulent discharge, lasting a few days, with a rapid decline to apparent healing. However, in the typical cases there is a complete absence of Stage II, and we immediately observe the decline of Stage III to Stage IV, which is the period of latency of the infection, or apparent healing. This interval is variable, and may lead to spontaneous healing, which is seldom the case, but usually results in mastoiditis or intracranial complications.

We must also consider the question of spontaneous cure in mucosus infection. Neumann-Ruttin² and Perkins⁴ reported such cases, which were followed up for periods varying from three to four months. During our observation of these cases, we could find but one case of spontaneous healing ten months after its recognition. There is a tendency for spontaneous cure in mucosus infections found in young children.

The following cases will illustrate the course of the infection in its typical form:

Group I: Case 1.—R. P., age 60, male, admitted Nov. 24, 1922. Patient admitted unconscious. History obtained through wife. Patient never had any ear trouble up to six weeks before admission. At that time he complained of severe headache and earache, but without fever or discharge from the ear. The pain soon left him and he continued at his usual occupation, but he was under treatment with galvanism for noises and difficulty of hearing. He continued well up to the day before admission, at which time he developed fever, vomiting, mental dullness, confusion, and complained of a stiff neck and disturbance of equilibrium. Temperature on admission was 40 degrees C.

Aural examination: Right ear, external meatus full of desquamated epithelium. No secretion in canal. Drum red, no details, bulging of posterior superior quadrant; left ear normal.

Eyeground examination shows optic papillitis not sharply defined, with indefinite changes and hyperemia of blood vessels.

Operation same day of admission. Mastoid process pneumatic with diffuse softening of bone. Dura of posterior fossa is free and covered with granulations. Thick, pulsating pus from sinus region. Sinus covered with granulations. Dura of middle fossa was exposed and showed thickened dura covered with a fibrinous layer. Sinus puncture gives blood. Puncture and incision of dura of posterior fossa negative. Lumbar puncture gives purulent fluid under increased pressure. Bacteriologic examination of pus from the mastoid and of spinal fluid gives pure culture of the mucosus organism. Sinus blood gave negative findings.

Autopsy revealed a diffuse purulent leptomeningitis.

Epicrisis: This is an illustration of a mucosus infection dating back to six weeks before admission, with mild symp-

toms at the onset. Then followed a period of quiescence with no symptoms referable to the ear. This latent period was then followed by the sudden onset of an intracranial complication. The insidious character of the mucosus is well illustrated where the large destruction of bone was out of proportion to the clinical picture.

Case 2.—C. M., age 53, admitted April 1, 1922. Illness began Feb. 12, 1922, following a grippe infection. Complained of sticking pain in right ear, with noises and a throbbing sensation. Four days later he came to the clinic. Otoscopic examination of right ear shows drum membrane diffusely red, no details, bulging of posterior superior quadrant. Paracentesis gives serosanguinous secretion. A few days later the incision closed, with increase of pains. Therefore another paracentesis was made, giving slight serous secretion. The incision again closed up, with no change in drum picture. A third paracentesis was done, with no improvement. Patient was admitted to the hospital because, after seven weeks' duration, there was still no improvement. Right ear shows sinking of posterior superior bony meatal wall. Nipple formation anterior inferior. Drum red. Mastoid is swollen and tender. C. V. 10 cm.; W. V., 0.

Operation April 2d. Pneumatic mastoid; cells filled with granulations; diseased bone leads to sinus with perisinus abscess. Sinus covered with granulations. Dura of middle fossa was exposed, as well as that of the posterior fossa. Both duræ covered with granulations.

Patient discharged as healed on April 28, 1922. C. V., 5 cm.; W. V., 0.

Epicrisis: This was a case of mucosus otitis following grippe and characterized by the absence of discharge after paracentesis on three different occasions. Then there developed symptoms of mastoid involvement with marked destruction of bone, as seen at operation.

Case 3.—S. M., age 44, admitted June 8, 1922. In March, 1922, patient had headache on the left side of the head, and a few days later he noticed secretion from the left ear, and the pain ceased. A month before admission his wife noticed a swelling behind the left ear, which was slowly increasing. Patient felt well up to a day before admission. In the evening

before the day of admission he complained of severe headache and vertigo and was very restless and irritable. On the day of admission he became unconscious with typical meningeal symptoms. Otoscopic examination: Right ear shows a chronic adhesive process. Left ear drum membrane is reddish white with blood vessel injunction. Bulging in superior posterior quadrant. Paracentesis gives pus under pressure. Temperature on admission, 39.2° C.

Operation June 8, 1922. Pus in mastoid. Sinus is free with a thick covering of granulations, and is free in its entire extent. The antrum is full of granulations. Dura of the middle cranial fossa was exposed, as well as that of the posterior fossa. The sinus is thrombosed and organized. Puncture and incision of both durae.

Patient died next day after operation. Autopsy shows phlebitis of left sigmoid and transverse sinus nearly to the torcular. Sigmoid sinus shows pus and an organized thrombus. Purulent leptomeningitis, edema cerebri. The jugular vein is normal.

Lumbar puncture showed a cloudy fluid and the mucosus in pure culture. Mastoid pus gives a pure culture of mucosus.

Epicrisis.—In this case there occurred very mild symptoms at the onset. For a period of two months the patient was apparently well. Then followed a fatal intracranial complication.

Case 4.—A. G., male, age 44, admitted August 28, 1921. Since April, 1921, at which time the patient had sticking pain in the right ear with no discharge, he has been well. On August 22, 1921, the mastoid region began to swell. Patient then complained of pain in the right ear. Otoscopic examination: Right ear drum membrane grayish red, short process of malleus visible, handle indefinite, no perforation. Sinking of posterior superior bony meatal wall. C. V., 25 cm.; W. V., 0. Typical vestibular reactions.

Operation August 29, 1921. Subperiosteal abscess with fistula near mastoid tip. Pus under pressure. Granulations in antrum, pneumatic bone. softening of bone throughout.

Discharged Sept. 9, 1921. C. V., ½ M.; W. V., a. c.

Mucosus in pure culture from mastoid pus.

Epicrisis.—For a period of four months after a history of otitis this patient was practically free from all symptoms refer-

able to the ear. He then developed symptoms and signs of mastoid disease with marked destruction of bone.

Case 5.—F. S., age 26, admitted Sept. 7, 1921. Male. On August 25, 1921, patient experienced sticking pain in the right ear. Three days later there was swelling and tenderness behind the right ear, which continued up to the day of admission. No discharge at any time. He has had headache during the last few days and is troubled by noises.

Otoscopic Examination.—Right ear, no discharge in the external meatus; drum membrane is red, thickened and bulged. No perforation is visible. There is sinking of the posterior superior bony meatal wall. Localized swelling is present in the region of the mastoid emissary. C. V., 3 M.; W. V., 25 cm. Typical vestibular reactions.

Operation Sept. 9, 1921. Infiltration of soft tissue over mastoid, and partly necrotic. Pus from mastoid. Soft bone leads to sinus, which is exposed.

Discharged cured. C. V., 10 M.; W. V., 4 M. Drum pale and opaque, details visible.

Epicrisis.—The absence of discharge in a typical case of mucosus infection with a mastoid complication is well seen here.

In many cases there is seen a departure from the typical clinical picture, and these cases begin to resemble those due to the streptococcus pyogenes infection. In order to explain this variable clinical picture, we must assume the presence of different strains of the mucosus organism, which have a tendency to produce more pus. In support of this assumption we found, upon bacteriologic examination, that 53 out of the 57 cases gave pure cultures of mucosus. This clinical variation manifests itself in Groups II, III and IV by progressive increase in amount and duration of discharge and by an increase in acuity of symptoms and signs until we come to a picture which is similar to a streptococcus pyogenes infection with incidental finding of mucosus in the pus.

The following cases will illustrate Groups II, III and IV:

Group II: Case 1.—J. H., male, age 56, admitted April 16, 1922. Statements of wife: Two weeks before admission patient had severe headache on left side. Paracentesis by an outside physician on April 11, 1922, with slight discharge. On

day of admission sudden discharge. Always good hearing up to beginning of the ear trouble. No vomiting or dizziness before onset of illness. During the day of April 16th, the patient acted very peculiar. Brought to the hospital with typical symptoms of a meningitis. Temperature, 39.2° C.; pulse 82.

Otoscopic examination: Right ear, normal; left ear, profuse serous secretion, nonfetid, sinking of posterior superior bony meatal wall. Drum membrane red, no perforation visible. No pathologic changes seen over the mastoid. Lumbar puncture gives cloudy fluid under increased pressure with fibrin flocules.

Operation at 1 a. m., April 17, 1922. Pneumatic mastoid, granulations in the antrum, some pus in the cells, cell walls soft and filled with granulations. Soft bone leads to root of the zygoma and middle cranial fossa.

Dura of both fossæ exposed with puncture and incision.

Exitus the same day. Autopsy shows a diffuse purulent meningitis with especial localization on the basis cranii. Spinal fluid, mastoid pus and meningeal pus all show pure culture of the mucosus organism.

Epicrisis.—The onset of this intracranial complication followed a history of ear trouble of five days' duration. We must assume that the occurrence of headache two weeks before admission was a symptom of a progressively mild otitis dating back long before the onset of the complication. This case also illustrates the difficulty of fixing the exact time of onset of the mucosus infection.

Group III: Case 1.—J. B., age 48, admitted June 5, 1921. Influenza infection 14 days before admission, followed by pain in the left ear and discharge. Otoscopic examination: Left ear, drum membrane red and bulging with perforation anterior superior quadrant. C. V., 2 M.; W. V., 3 cm. Spontaneous nystagmus to both sides. No spontaneous past pointing. Paracentesis on June 6, 1921, with purulent secretion, nonfetid. C. V., $\frac{1}{2}$ M.; W. V., 0. Spontaneous nystagmus is less.

June 8, 1921.—Nipple anterior superior, drum clearing in the center with marked mucoid discharge. Rapid change of discharge.

June 12, 1921. No secretion one week after admission. Drum entirely clear. Patient complains of headache.

June 27, 1921. Patient is discharged. C. V., 12 M.; W. V., 6 M. Drum membrane looks normal.

Readmitted August 9, 1921. Patient noticed a swelling of retroauricular area a few days after leaving the hospital, with a return of the headache and discharge from the left ear. Between both admissions the patient complained of no earache, only of the swelling behind the left ear.

Otoscopic examination: Left ear, drum diffusely red, no details, pulsating secretion in anterior inferior quadrant. C. V., 15 cm.; W. V., a. c.

Operation August 10, 1921. Diffuse softening of the mastoid bone, pus from the antrum. Bacteriologic examination on August 11, 1921, showed staphylococcus albus and streptococcus pyogenes.

Operated on for the second time Sept. 20, 1921. The remaining bone of the previous operation now found to be filled with soft granulations.

Discharged on Oct. 18, 1921. Drum membrane opaque, details distinctly visible. C. V., 12 M.; W. V., 4 M.

Readmitted for the third time on Oct. 28, 1921, complaining of a painful swelling in lower half of the mastoid wound.

Operation for the third time on Nov. 3, 1921. Bone soft in relation to the middle fossa and sinus. Bacteriologic examination of the mastoid pus shows a pure culture of the staphylococcus mucosus.

Patient discharged as cured on Jan. 22, 1922. C. V., $\frac{1}{2}$ M.; W. V., a. c.

Epicrisis.—This is a case of acute onset with a clearing up of symptoms and discharge three weeks after onset. Then followed a prolonged period of quiescence. Subsequent operations gave characteristic bone changes. Early bacteriologic examination gave no mucosus culture because it was masked by the virulence and abundance of the other organisms. The otitis followed upon an influenza infection.

Group IV: Case 1.—J. K., age 25, male, admitted June 21, 1922. Scarlet fever the first year of life. Discharge from right ear since. Three months before admission there was increased discharge, pain in the ear and swelling behind the ear. The pain and swelling disappeared with treatment. Three weeks before admission the pain and swelling recurred, but the swelling dis-

appeared over night, followed by an increase in amount of discharge. The swelling reappeared four days before admission.

Otoscopic examination: Right ear, external meatus full of nonfetid pus. Fistula in posterior superior bony canal wall, with granulations from antrum region. Granulations on floor of tympanic cavity. Right mastoid shows signs of a subperiosteal abscess. Left ear, normal.

Operation June 22, 1922. Fistula in the remains of the mastoid fissure. Sinus free and covered with granulations from lower to upper knee. Bone around antrum soft and filled with pale, hard granulations. No evidence of chronic otitis in the mastoid. The dura of the middle cranial fossa was free. Further course uneventful. Patient discharged 15 days after operation. A large central perforation visible in drum; therefore, a mixed infection.

Bacteriologic examination showed the presence of the streptococcus pyogenes and the streptococcus mucosus.

Epicrisis.—This is a case of mixed infection in which the mucosus was working independently of the streptococcus pyogenes, as shown by marked bone destruction. A diagnosis of mucosus infection could not be made before operation, except by bacteriologic examination. The presence of the mucosus was covered up by the streptococcus pyogenes and an acute exacerbation of the latter infection occurred a few days before admission.

Case 2.—J. B., male, age 64, admitted March 30, 1922. Grippe infection ten weeks before admission, after which he developed earache and headache on the left side, with discharge from the left ear. The headache, earache and discharge continued with increasing intensity up to time of admission.

Profuse purulent discharge from left ear, perforation in anterior inferior quadrant with pulsation. Sinking of the posterior superior bony meatal wall. Mastoid tip tender to pressure. Left ear, C. V., a. c.; W. V., 0. Vestibular reactions normal.

Operation shows hard, pale granulations in the antrum with slight amount of pus. Cells in direction of middle fossa containing granulations. Granulations without pus in the petrous angle. Middle fossa free near the superior border of the petrous portion of temporal bone. Dura of the posterior fossa free and covered with granulations.

Patient remained in the hospital 15 days, with uneventful course. At time of discharge the drum membrane was red, no details visible, and no perforation visible.

Epicrisis.—The activity of the mucosus is well shown in this case. There was little pus in the mastoid, with a great deal of granulation tissue, and marked destruction of bone, with exposure of the middle and posterior cranial fossæ. The severe headache with the absence of temperature were outstanding features in this case.

Case 3.—L. S., male, age 50, admitted February 28, 1922. Patient states that he has never had any ear trouble. Fourteen days before admission he experienced sticking pains in the right ear. Eight days later a paracentesis was made by an outside physician. Temperature on day after the paracentesis was 37.8° , with intensity of pain increased.

Otoscopic examination shows upper part of drum membrane bulged. A teatlike process is seen in the posterior superior quadrant. Remainder of the drum is covered with macerated epithelium. Mastoid tip is tender. Right ear, C. V., 10 M.; W. V., a. c. Vestibular reactions typical.

Paracentesis on Feb. 28, 1922. On March 1, 1922, the teatlike process is not visible, bulging in the posterior superior quadrant. Posterior border of the mastoid is tender at insertion of the sternomastoid muscle. Rigidity of the neck muscles. Paracentesis again on March 1. On March 2, there is no sinking or tenderness over the mastoid process.

Operation March 2d. Pneumatic mastoid, hyperemia and granulations in cells. Diseased bone leads to the dura of the middle cranial fossa and the sigmoid sinus, but the sinus is not free. Temperature on day of operation was 40° C.

March 3. Temperature, 40° C. A septic temperature typical of sinus thrombosis continued for 16 days after operation. Bacteriologic examination of pus from the masoid on March 3rd gives a pure culture of the mucosus. Bacteriologic examinations of sinus and arm blood on three different occasions give pure culture of the mucosus. On March 13th, the sinus and arm blood are sterile. March 18th, the patient is afebrile.

Patient discharged on April 6, 1922, after a stay of 35 days in the hospital. Drum membrane is pale, details distinctly visible. W. V., $\frac{1}{2}$ M. Reexamined January 3rd, 1923. Drum

membrane is slightly retracted, light reflex visible, as well as the details. W. V., 4 M.; C. V., 7 M.

Epicrisis.—This composite picture is a case of osteophlebitis Körner and runs the typical course of a sinus thrombosis with a pure culture of mucosus from the sinus and arm blood. It is also remarkable that there was no discharge from the middle ear. The onset and progress resemble a complicating streptococcus pyogenes infection.

Case 4.—T. B. L., age 48, admitted Jan. 29, 1922. Patient has had a left sided chronic middle ear discharge since 16. As a result of a grippe infection, it exacerbated before admission. Patient complains of a severe headache and dull cough.

Left ear, posterior superior perforation. Bloody purulent secretion, nonfetid. Drum membrane red. Mastoid negative. C. V., a. c.; W. V., 0. No spontaneous nystagmus. Typical vestibular reactions. Temperature on admission, 38.7° C. January 30, 1922, severe occipital headache with some meningeal symptoms. Spontaneous nystagmus, second degree to the left side. Temperature, 37.5° C. Eyegrounds normal. Lumbar puncture cloudy, and under increased pressure, with polynuclears in large amount.

Operation Jan. 30, 1922. Sclerotic mastoid. Pus wells up from the antrum. Dura of the middle fossa is free, bulging and is covered with granulations. The sinus is exposed and shows inspiratory collapse with normal walls. Puncture and incision of both cranial fossa negative.

Exitus on Jan. 31, 1922. Autopsy shows a purulent leptomeningitis of posterior fossa and posterior part of the middle fossa. Exudate in both fissuræ Sylvii. Parietal thrombus in the left transverse sinus.

Pus from the antrum and meninges shows a pure culture of the mucosus.

Epicrisis.—The grippe infection was in the foreground of this clinical picture, and we must assume that the streptococcus mucosus was already present in the mastoid bone. The large amount of bone destruction must have been going on for some time, as shown by the onset of a fatal meningitis only 24 hours after admission. The presence of a sclerotic mastoid is unusual, and can be explained by the very old chronic middle ear infection.

Operative Findings.—The operative findings in mucosus are so characteristic that one can make a diagnosis of this infection even before bacteriologic examination is done. The extensive and diffuse softening and destruction of bone, the hard, pale granulations cannot be mistaken for any other infection. Because of its slow growth and predilection for bone, the destructive process can be widespread without the production of clinical symptoms. The dura of the middle and postcranial fossæ, as well as the sigmoid sinus, are often found exposed and covered by granulations. The diseased process can be found limited to the mastoid bone, as in 23, or 40.3 per cent of our cases. Cases in which the sinus or dura, or both, were free by process of bone destruction occurred in 27, or 47.8 per cent of our series. Meningitis before operation was observed in 7, or 11.9 per cent of this series, all of which proved fatal. Ruttin¹⁰ and O. Beck¹¹ report many cases of mucosus meningitis coming under their observation. One of the cases produced a typical picture of osteophlebitis. Another case produced a diffuse labyrinthine inflammation with subsequent fatal meningitis. Of 57 cases, only two were observed with sclerotic mastoid. Therefore, we can say that a pneumatic mastoid invites a streptococcus mucosus infection, although Winkler¹² holds a contrary opinion.

Bacteriology and Pathology.—Schottmüller¹³ described the streptococcus mucosus in 1906, and classified it as a member of the streptococci group on the borderline between that group and the pneumococci. In a more recent classification, Park and Williams¹⁴ classify the streptococcus mucosus as constituting Group III of the pneumococci. It grows best on hemoglobin agar and is characterized by the production of mucus which acts as a capsule for the organism. Its life cycle is three or four days, after which it cannot be transplanted, but if a fat substance is streaked on the agar we will then get a large growth for a period of 30 days or more, the fat acting as nourishment. If the mucous capsule surrounding it disappears, it cannot be cultivated again and its virulence is lost. After the second or third day of growth, the organism becomes hemolytic, and as such as there may be an explanation for the large destruction of bone. It is best stained by an aqueous solution of thionin 1/10 for one minute, the capsule staining pink.

Very frequently it is observed that the capsulated organisms are not stained, because the organism, from the middle ear secretion being older, has lost its capsule. However, the younger generations that make their way into the mastoid process possess a capsule that can be stained, and it is the capsulated coccus that is responsible for the large amount of bone destruction. The organism occurs in the nose and throat in less than 1 per cent of normal individuals. It has been cultivated from cases of sepsis, pneumonia, meningitis and angina. Axenfeld¹⁵ has found it in conjunctivitis.

The frequent occurrence of this infection after influenza resembles the streptococcus infection in other parts of the body, as seen during the recent influenza pandemic. The influenza infection lessens the resistance to disease caused by the streptococcus or pneumococcus groups.

The outstanding feature of the process is the small amount of exudate, with marked tendency to proliferation and organization, and marked destruction of bone. Reparative processes, as shown by organization and new bone formation, are also observed in the pathologic process.

X-Ray Examination.—Roentgen ray study of these cases was not made, because this aid to diagnosis is not taken advantage of in all cases in this clinic. However, X-ray examination should be used to control the progress of the case. When a mastoid, which is pneumatic in character, shows a shadow or darkening after the healing of the otitis media, it is necessary to keep such a patient under observation. In this disease one should especially look for an extensive melting process as an indicator of progressive destruction of bone. Winkler¹² recommends X-ray examination in these cases very highly.

Intracranial Complications.—The extensive destruction of bone with consequent exposure of the cranial fossæ has been referred to under the operative findings. Characteristic is that the complications resemble those of an acute infection and are of a diffuse or localized nature. Wittmaack¹⁶ refers to the tendency of the otitis media, caused by the streptococcus mucosus, to produce severe and fatal intracranial complications.

Diffuse purulent leptomeningitis, with pure culture of streptococcus mucosus in the spinal fluid, proved fatal in all cases.

Schlandler and Hoffman¹⁷ report a fatal case of postoperative latent meningitis following a mucosus labyrinthitis, which occurred two months after a simple mastoidectomy. J. Fischer¹⁸ reports a case of panotitis with meningitis only seven days after the beginning of the acute otitis, and due to the streptococcus mucosus, secondary to a grippe infection. Localization of this infection occurs, as shown, by extradural abscess. Sinus thrombosis and septicemia occurred once in this series.

CONCLUSIONS.

1. Streptococcus mucosus occurs with greater frequency than we have hitherto believed, and the recognition of its clinical picture will aid us in isolating it from other forms of middle ear infection.
2. The infection occurs more frequently in the middle aged and elderly, with the male sex predominating.
3. A previous history of influenza was found in 29 per cent of these cases. The association of streptococcus infection with influenza is again illustrated in these cases. Most of the cases occurred during the first three months of the year.
4. A study of these cases enables us to divide their clinical course into a typical form and several variations. These variations show a departure from the typical form by an increase in acuity of symptoms and signs until the clinical picture is similar to the streptococcus pyogenes infection.
5. The organism has a marked affinity for bone, the widespread destruction of bone being out of proportion to the clinical picture.
6. Bacteriologic examination should be made of all secretions from the tympanic cavity.
7. X-ray examinations are invaluable in controlling the progress of a middle ear infection.
8. Intracranial complications may be localized or diffused, the diffuse forms usually ending fatally.
9. Absence of temperature in uncomplicated cases is characteristic of this form of infection. Moderate elevation of temperature is often observed in cases complicated by sinus thrombosis and meningitis.

10. We should pay more attention to hearing tests, which are important in indicating healing or progress of middle ear infections.

We wish to thank Professor Dr. H. Neumann for making available for our study the material in his clinic, and Dr. J. Popper for his aid in translating the clinical histories.

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XLII.

THE VALUE OF THE VESTIBULAR EXAMINATIONS IN INTRACRANIAL LOCALIZATION — REPORT OF CASES PROVEN EITHER BY OPERA- TION OR AUTOPSY.*

By F. C. LEVITT, M. D.,

SAN FRANCISCO.

Any investigation which adds to our knowledge of the function or anatomy of any part of the body is of value. When the knowledge thus obtained aids us clinically and can be applied with benefit to our patients, it becomes of the greatest importance, not to a few in some special work, but to all. Of such value is the work that has been done in the investigation of the relation of the internal ear to the central nervous system. This study has not only added to our knowledge of the anatomy and physiology of the internal ear in its relation to the central nervous system, but has also given us the means of obtaining data, valuable from a diagnostic point of view, in the examination of our patients. While neurotology has bridged the borderline between otology and neurology, it has not traveled the King's Highway in gaining this position. About 1907, Barany of Vienna gave to the medical world his epoch marking investigations of the reactions of the vestibular apparatus. For several years his wonderful work concerned only otologists. About 1915, a group of American investigators (of this group the names of Isaac Jones, Lewis Fisher and Eugene Lewis will always be considered the pioneers) began to extend the study of the relation of the vestibular apparatus to the anatomy and pathology of the central nervous system. From this time, neurotology hit the "rough road to fame." Due to faulty technic and faulty interpretation of results, some claimed almost impossible possibilities for these tests, and soon neurotology was considered a "diagnostic all" (if I may use

*Thesis accepted by American Laryngological, Rhinological and Otological Society.

that term) for intracranial localization. Slowly but surely, as case after case came to operation or autopsy and the diagnosis of the overenthusiast was not proven, those who were most interested in this work saw the pendulum gradually swinging in the opposite direction and the reaction against these tests rightfully growing. However, those sincerely interested in neurotology continued the investigations until today they feel that it has begun to climb to the position, as an aid in the localization of neurologic conditions, to which it will eventually rightly attain. Thus this work has passed through the different stages of overenthusiasm, repudiation, and finally conservative acceptance, and this has been the retold story of all medical discoveries or advances.

While I have no wish to take one iota of honor or praise away from Barany for his wonderful discoveries and development of this work, I feel that the name "Barany tests" should be discarded. "Barany tests" mean nothing to many people. When we speak of the examination of the vestibular apparatus, we tell just what is done. It is nobody's tests, it is the examination of a definite anatomic entity. Let us speak of it in that way and give the study of the examinations a definite name—"neurotology"—the relation of the internal ear to the central nervous system.

With the continued study of the several problems of neurotology, some of the more or less dogmatic statements which were formerly postulated have been modified; on the other hand, information has been developed making more certain more of the previous hypotheses. This has developed chiefly through the influence of the following factors: More cases carefully studied, more accurately standardized technic, and more conservative interpretation of the findings. The result has been to lift neurotology towards the niche of medical diagnosis where it will eventually rightly rest.

While the title of this thesis confines me to certain classes of pathologic cases, it may not be amiss here to give, briefly, the present views of the anatomy and physiology of the vestibular apparatus. The controversies on these subjects have been the chief stumbling blocks to the interpretation and acceptance of our examinations.

One of the most important changes has been in regard to the intracranial pathways of the fibers from the different canals. On page 127 of "Equilibrium and Vertigo," Jones says:

"Summarizing, we are confident that the fibers from the horizontal canals and the fibers from the vertical canals have separate pathways in the brain stem. This is absolute. That the horizontal canal fibers are confined to the medulla oblongata and enter the cerebellum through the inferior cerebellar peduncle, and that the vertical canal fibers ascend into the pons and enter the cerebellum through the middle peduncle, we believe to be highly probable; but we feel that the evidence to date is not sufficiently large to make absolute the exact course of the fibers. Therefore, the tracts that we are about to present are, of course, not to be regarded as final. They do, however, represent the logical conclusions from our evidence to date. Furthermore, when used as a working basis for the examination of patients, this conception of the vestibular pathways has furnished diagnostic data which have proven surprisingly reliable. Further observation by ourselves and others may, no doubt, modify or change our conception of the exact course of the fibers. In the main essentials, however, these tracts may be regarded as accurate, and in presenting them we will speak dogmatically for the sake of clearness."

In a paper by Jones and Ingham, read before the American Otological Society in 1922, they again say in regard to this neuraxial differentiation:

"Our conception of this differentiation is that there is a divergence of the vestibular fibers within the brain stem, in such a manner that the fibers in relation to the vertical canals are separated by an appreciable distance from those in relation to the horizontal canal. This separation is considered to be sufficient to permit macroscopic lesions to exert a selective effect upon one set of fibers and not upon others. . . . While much remains to be learned of the intramedullary pathways and connections of the vestibular fibers, the evidence indicates that there is an appreciable separation of the neuraxial pathways of the fibers in relation to the horizontal canal and of the fibers in relation to the vertical canals."

The evidence for and against this assumption which they so concisely give in their article has no place in this thesis.

Nor is it the purpose of this paper to enter into a discussion of the controversies in regard to the physiology of the vestibular apparatus. While it may be of great importance physiologically whether the transmission of the impulses is due to the actual flow of the endolymph within the semicircular canals which acts upon the crista ampullaris of each canal and by its direction determines the nature of the response (as held by Breuer, Mack, Jones and others), or whether, according to Maxwell, it is not an endolymph flow in the canals but the effect of a tension change due to the displacement of the otoliths, to us as otologists is of little importance.

Regardless of these discussions, the merits of which do not have to be decided here, we know that due to certain stimulation, either rotation or caloric, there occur in the normal individual certain definite reactions. Of these reactions, there are two chief or primary—nystagmus and vertigo, and secondary to vertigo—past pointing.

The reliability and accuracy of nystagmus, either as a test or a reaction, has been rather severely criticized on the ground that repeated rotations have a tendency to lower the duration time. In answer to this criticism, I would mention the work of Heitger. He took a series of reaction times for nystagmus and vertigo. The subjects were professional dancers. The findings showed that there was no reduction in the nystagmus time but that there was a marked reduction in the duration of induced vertigo. Those of us who were in the medical service of the aviation corps found the same to be true of the graduated flier—always a reduction in the vertigo time (as should be), but the nystagmus time remained practically the same as found in the aviators' original examinations.

Experience has taught us that certain types of nystagmus have a certain significance. A spontaneous vertical nystagmus has been observed so frequently in patients with proven lesions in or near the brain stem that, while not pathognomonic, it has come to be considered as very suggestive of a lesion in or near this region, particularly if other evidence of intracranial involvement is present.

Likewise, a perverted nystagmus may be considered as suggestive of a lesion in or near the brain stem, although the number of proven cases is as yet small. In the interpretation of

this phenomenon, we must take into consideration the results of a lesion in the brain stem or the indirect effects of a near by pressure.

A conjugate deviation of the eyes after stimulation—in other words, the absence of the quick component of nystagmus—is suggestive of an intracranial lesion.

Vertigo, the second primary reaction of vestibular stimulation, is a cerebral phenomenon resulting from impulses carried by way of certain pathways from the ear, through the cerebellum to the cerebral cortex.

Equilibrium is maintained by a continuous flow to the brain of afferent impulses from the end organ, the eyes and the kinesthetic sense, which includes the touch, muscle, joint and visceral sense. Normally these afferent impulses are in such a harmonious relationship with each other that we are not aware of them. That this subconscious harmonious relationship is as it should be, can readily be appreciated if we would but think of the great number of different motions we perform, without conscious effort on our part, in the struggle for existence. Any relationship which would demand a constant recognition and adjustment to each movement would be a tremendous hindrance to our progress and development, and even to our existence.

One must realize that the aid in the maintenance of equilibrium obtained from both the visual and kinesthetic sense is only a part of their function, while the sole function of the static labyrinth is the maintenance of equilibrium.

Whenever an interruption or disassociation of the subconscious relationship of these afferent impulses occurs, there is a conscious realization of the fact, resulting in a confusion. This confusion, which results in a disturbed relationship of one's body to objects in space, is called vertigo.

The usual description of vertigo is a sensation of rotation, either of the individual or of the surrounding objects. This is true of vertigo in its most severe form. On the other hand, we may have a sensation not of rotation but of the individual or the surrounding objects falling or swaying to either side, forward or backward. Again, vertigo may vary from a transient momentary feeling of slight uneasiness or unsteadiness, after which everything is normal, to the more severe form in

which any motion or change of position will produce an attack, thus preventing the individual from following his normal pursuits. The duration may vary from a few seconds to several hours.

Dependent upon vertigo is past pointing. A normal person with eyes closed can always determine the position of his hand or finger in space and can always locate, with eyes closed, an object previously touched by him.

Of all the reactions, past pointing is probably the most uncertain. It is a voluntary act and dependent upon a subjective sensation. As the sensation of vertigo is subject to education (as witnessed by our aviators) past pointing may be considered as the least important of all reactions. However, in the uneducated patient, certain knowledge may be gained from this reaction. If we find a spontaneous past pointing in one direction; or, without a spontaneous past pointing, an inability to produce a reactive past pointing, it is suggestive of a lesion in the cerebellum. On the other hand, when we are able to produce a normal past pointing of each arm in either direction, it is probable that the cerebellum is intact. Of course, as in all methods of diagnosis, there are exceptions to this rule, but in general the above holds true.

In the examination of the vestibular apparatus, we not only test the internal ear, but also a large portion of the central nervous system. We can determine the intactness of the internal ear, the eighth nerve, as well as the various afferent pathways, and the intracranial structure through which these fibers pass. What do we hope to learn from these examinations? Is the lesion peripheral or central, and, if central, where is it? In many cases the findings will be helpful in reaching a localization, especially if studied, as they should be, in conjunction with the findings of the other examinations.

The cases which are submitted are those which were examined personally by the writer and later came to operation or necropsy and the lesion proven. There have been many cases examined in the Out Patient Department in which the findings have been definite enough to suggest certain intracranial lesions, but, like all other clinics, the patients cannot be controlled and eventually wander away and are lost sight of. Likewise, there have been many cases examined for the Medical

Service where the neurotologic findings have checked up with the medical diagnosis. But as none of these cases have been proven by operation or autopsy, they have not been included in the series here presented.

A word in regard to the histories and examination accompanying these cases. I have tried to do away with the boredom of reading "elongated" histories, and with this idea in view have presented only a brief resumé of the points in the history which appeared important to the subject in question. In all justification to those responsible for the histories, I must state that the originals are very full and complete. It is also very probable that, in my endeavors to be brief, I have omitted several points which, to the neurologist, would appear to be essential. If such is the case, then my apology is that these cases are to be presented, not to the neurologists but to the otologists, and while I have endeavored to include all the essential points of value to both neurologists and otologists, if sins of omission have been committed, it has been done for the sake of brevity.

In the cases which follow, the findings are a verbatim report of my original examinations and impressions, as reported to the particular service to which the patient belonged. When possible, the preoperative diagnosis has been included, as well as the operative or autopsy findings.

CEREBELLOPONTINE ANGLE LESIONS.

Cerebellopontine angle lesions are of special importance to the otologist. It frequently happens that he is the first to be consulted by the patient for a gradual progressive loss of hearing in one ear, and with such a complaint he must always have in mind the possibility of a lesion in this region.

The neurotologic findings in cases presenting an angle lesion are probably more definite than for any other intracranial location.

The typical findings present:

1. On the side of the lesion—loss of cochlear and vestibular function.
2. On the side opposite to the lesion, normal cochlear function; normal responses from the horizontal canal; absence of responses from the vertical canals.

In the following series of nine proven cases, these findings were as follows:

On side of lesion—		Percentage
Deafness	8	89
No involvement	1	11
Absent or perverted responses from horizontal canal.....	9	100
Absent or perverted responses from vertical canals.....	9	100
On side opposite to lesion—		
Hearing uninvolved.....	9	100
Perverted responses from horizontal canal.....	1	11
Normal responses from horizontal canal	8	89
Absent or perverted responses from vertical canals	9	100

While the above findings are typical, still there has not been a sufficient number of cerebellopontine angle lesions carefully studied neurootologically to permit of a definite interpretation of our findings.

For the present, and until a sufficient number of proven cases have been recorded, we must be satisfied in our reports to suggest the location of the lesion and, with this suggestion and whatever other data we may have, leave the diagnosis to the neurologist.

Case I.—Marjorie H., Hospital No. S-6322. First seen in February, 1920. Complaint, failing vision, uncertain gait, tinnitus in left ear. In 1915, first noticed a "buzzing" in the left ear and an "unsteady" feeling as if going to the left. The vertigo has gradually become constant, more marked and at times accompanied by nausea and vomiting—but not of the projectile type. Has a sensation of turning to the left and for the past few years has a tendency to stagger to the left. Has fallen once to the left. Staggering is increasing. About the same time (1915) began to notice that the hearing in the left ear was becoming impaired and an intermittent tinnitus had developed. The hearing has become worse and the tinnitus constant. In 1919, first noticed trouble with vision. Consulted an optician, who treated her by repeated changes of glasses. The failing vision, unsteadiness, deafness and vertigo have all gradually increased up to the present time.

Examination: Physical, essentially negative. Eyes, bilateral choked discs.

VESTIBULAR EXAMINATION.

Hearing:	Right Ear:	Normal
	Left Ear:	Absolute deafness.
Spontaneous		
Phenomena:	Nystagmus	Looking straight ahead — marked rotatory to right. Looking to right — horizontal to right. Looking to left — horizontal to left. Looking up — combined vertical up and rotatory to right.
	Past pointing	none.
	Falling	Tendency to fall to left and back, regardless of position of head.
Rotation:	To right	Nystagmus, horizontal to left, good amplitude, 10 seconds' duration, and then changes to the spontaneous rotatory to right. Past pointing, correct direction but shortened amplitude and duration each arm.
	To left	Vertigo, 5 seconds' duration. Nystagmus, horizontal to right, good amplitude, 15 seconds' duration, and then changes to spontaneous rotatory to right. Past pointing, correct direction but shortened amplitude and duration each arm.
Caloric:	Head forw'd	Vertigo, 15 seconds' duration.
	Right ear	30 degrees. Water 68 degrees. Nystagmus, rotatory to left, good amplitude in 45 seconds. Past pointing, none either arm. Vertigo, none. Head back, nystagmus, horizontal to left, good amplitude. Past pointing, normal. Vertigo, normal.

Left ear Because of the spontaneous rotatory nystagmus to right, water at 112 degrees used.
 Nystagmus, no change after 4 min.
 Past pointing, none.
 Vertigo, none.
 Head back, nystagmus, no change.
 Past pointing, none.

Summary: Absolute deafness left ear; nonresponsive left vestibular apparatus; involvement vertigo pathway right vertical canals; responsive right horizontal canal.

Diagnosis: Left cerebellopontine angle lesion.

Operation: Dr. Naffziger—left acoustic neuroma.

Pathologic report: Fibroma.

Case II.—James O. First seen March, 1920. Complaint, headaches in right parietal region for the last year. Vertigo and staggering, but to no particular side. Has fallen once to the left side. Also noticed hearing was very poor in right ear. Tinnitus at times in right ear. All these symptoms began about a year before the patient was first seen and were attributed by him to an ulcerated tooth which was extracted. Also complained "of a cold feeling in corner of mouth on right side, also at times a numb feeling on cheek and lower jaw."

VESTIBULAR EXAMINATION.

Hearing: Right Ear: Absolute deafness.
 Left Ear: Normal.

Spontaneous

Phenomena: Falling None.
 Past pointing None.
 Nystagmus Looking straight ahead—none.
 Looking to right—marked horizontal to right.
 Looking to left—moderate horizontal to left.
 Looking up—combined vertical upward and rotatory to left.
 Looking down—slight rotatory to right.

Rotation: To right: Nystagmus, horizontal to left, faint amplitude, 15 seconds' duration.

- Past pointing, correct direction but shortened amplitude both arms.
Vertigo, shortened (10 seconds' duration).
- To left: Nystagmus, horizontal to right, fair amplitude, 20 seconds' duration.
Past pointing, normal each arm.
Vertigo, shortened (10 seconds' duration).
- Caloric: Head forw'd 30 degrees. Water 68 degrees. First examination.
- Right Ear: Nystagmus, none.
Past pointing, none.
Vertigo, none.
Head back, nystagmus, none.
Past pointing, none.
- Left Ear: Nystagmus, horizontal (perverted) to right, good amplitude in 30 sec.
Past pointing, normal each arm (to left).
Head back, nystagmus, oblique upward and to right.
Past pointing, normal (to left).
Head forward 90 degrees, nystagmus, oblique down and to left.
Past pointing, normal (to right).
- Caloric Sec'd Exam.: Head forward 30 degrees. Water 68 degrees.
- Right Ear: Same results as previous examination.
- Left Ear: Head back as primary position.
Nystagmus, horizontal to right, marked amplitude beginning at 19 seconds. As douching continued the nystagmus changed to oblique up and to right.
Past pointing, normal (to left).
Head up, nystagmus again changed to horizontal to right.

Past pointing, normal (to left).
 Head forward 90 degrees, nystagmus changed to horizontal to left.
 Past pointing, normal (to right).

In my report to the physician who had referred the patient to me I said: "These tests suggest a lesion in the region of the cerebellopontine angle on the right side."

The patient was not seen again until January, 1921. In the meantime he had been given a course of antiluetic treatment. At this examination in January, 1921 (nine months after the original examination), the findings were still more definite.

There was no change in the bearing of either ear.

In addition to the spontaneous nystagmus upon looking in the different directions, which was the same as found in the previous examination, there was a combined vertical upward and rotatory nystagmus to left on looking straight ahead. Also there was now a definite falling to the right, regardless of the position of the head.

The rotation tests gave practically the same findings as in the previous examinations.

Caloric: Right Ear: Because of the spontaneous nystagmus to the left now present, water at 112 degrees was used.

Nystagmus, no change in the spontaneous type.

Past pointing, none.

Vertigo, none.

Head back, nystagmus, no change.

Past pointing, none.

Caloric: Left Ear: Because of the spontaneous nystagmus to the left, water at 68 degrees was used and the head back as the primary position.

Nystagmus, marked horizontal to right in 20 seconds.

Past pointing, normal.

Head up, nystagmus disappears for a short time, then spontaneous rotatory to left reappears.

Past pointing, none.

Summary: Absolute deafness right ear; no response from right horizontal and vertical canals; no response from left vertical canals; responsive left horizontal canal.

Diagnosis: Lesion of right cerebellopontine angle.

Operation: Dr. Naffziger. His report said: "At operation a cyst was found containing cerebrospinal fluid, overlying a deeper tumor which apparently sprang from the dura and involved the right eighth nerve and dislocated the pons to the left side."

In this case these tests suggested the diagnosis nine months before it was verified by operation.

Case III.—Jacob D., File No. 10200. First seen March, 1921. Complaint: For the last ten years has been troubled with increasing deafness and head noises, especially in left ear. Gradual loss of vision. Nine months ago began to develop diplopia—more marked when looking to the left. About four months ago, began to have attacks of vertigo. These were at first intermittent, but have become more severe and frequent lately. Has the sensation of his own body turning from right to the left. Although he has never fallen, has a sensation of falling to the left and staggers to this side when walking. Noticed a gradually increasing deafness in left ear for the past ten or fifteen years "following a dose of quinin." About this same time noticed a tinnitus which has become constant in left ear. During the past two months there has been a gradually increasing failure of vision, more marked in left eye. Lately attacks of vomiting two or three times a week. Occasionally occipital headaches.

Examination: In September, 1920, was examined in the Out Patient Department. Wassermann three plus. Was treated with mercury benzoate for several weeks without improvement of symptoms. On March 17, 1921, Wassermann still three plus.

Physical examination: Negative.

Neurologic examination: Cranial nerves—I, negative.

II, bilateral choked discs.

III, IV, VI, diplopia, paresis left internal rectus, horizontal nystagmus.

V, numbness left side of face.

VII, slight facial weakness on left side. Taste diminished on left side of tongue.

VIII, see report.

IX, XII, negative.

Marked ataxia of left hand and foot. Deviates to left when walking.

Possible diagnosis: (1) Cerebrospinal syphilis. (2) Brain tumor—posterior fossa left side, probably acoustic tumor.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: diminished O. M. C. C.

Left Ear: absolute deafness.

Spontaneous

Phenomena: Nystagmus Looking straight ahead — rotatory to right.

Looking to right—rotatory to right.

Looking to left—horizontal to left.

Looking up—combined vertical upward and rotatory to right.

Past pointing none.

Falling always to left regardless of position of head.

Rotation: To right: Nystagmus horizontal to left, good amplitude, duration 10 seconds before appearance of spontaneous rotatory type to right.

Past pointing, correct direction, slightly shortened duration and amplitude each arm.

To left: Nystagmus, horizontal to right, good amplitude, 15 seconds' duration before appearance of spontaneous rotatory type to right.

Past pointing, correct direction but shortened amplitude and duration each arm.

Caloric: Head forw'd 30 degrees. Water 68 degrees. First examination.

Right Ear: Nystagmus, the spontaneous rotatory nystagmus to right stops in 30 seconds, and in 43 seconds a distinct combined horizontal to left and oblique upward and to left appears.

- Past pointing, correct both arms.
 Vertigo, normal right to left.
 Head back, nystagmus, oblique upward and to left, good amplitude.
 Past pointing, normal.
- Left Ear: On account of spontaneous rotatory nystagmus to right, water at 112 degrees was used.
 Nystagmus, no change in type or direction of nystagmus after 3 minutes.
 Past pointing, none.
 Vertigo, none.
 Head back, nystagmus, none.
 Past pointing, none for either arm.
- Caloric: Second Examination.
 Head Back 60 degrees as primary position.
 Water 112 degrees.
- Left Ear Nystagmus, none after 4 minutes.
 Past pointing, none.
 Vertigo, none.
 Head up, nystagmus, no definite nystagmus. At times a few twitchings of the spontaneous, rotatory to right.
 Past pointing, none for either arm.
- Vestibular diagnosis: Left sided posterior fossa lesion in region of left cerebellopontine angle.
- Operation: By Dr. Naffziger. Tumor verified and removed.
- Case IV.—Julius W. War Risk Insurance Bureau Case. Referred by Dr. Naffziger. History No. 3510. First seen September, 1921. Complaint: Pain in head, more on right side, for last two months. In the first part of July, 1921, patient noticed pain in head. At first intermittent, but later these headaches occurred each day, beginning in the morning and gradually disappearing towards the end of the day. In the latter part of July headaches became continuous and generally worse in the morning. In the following month, first noticed a numbness on the right side of face and a drawing sensation in right eyelid. The following month (September) noticed a "draw-

ing sensation in the right side of jaw, feeling as though my right eye was drawing down and the right corner of my mouth up." "Dizziness has not been noticed until the last few days (I saw the patient for the first time on September 26, 1921), generally caused from some quick movement, to sit down for any length of time and get up quickly or turn around quickly; when walking slowly and turning quickly." The vertigo is unaccompanied by nausea or vomiting and patient cannot tell whether he or the external objects seem to rotate or in what direction. For the past month has noticed an unsteadiness on his feet with a distinct tendency to stagger to the right, although he has never fallen. This unsteadiness is gradually increasing.

Deafness was first noticed "some time in June or July, 1918. About that time I had a slight ringing in the ear, in fact both ears; was too busy at the time to take much notice of it. From April 25th to July 6th, 1918, heard plenty of loud noise. At times, very close to our own heavy artillery. The right ear is worse and the deafness is increasing. There is no severe pain in the ear."

As this was a case referred simply for the vestibular tests, it is unfortunate that I cannot give the physical or the neurologic findings.

VESTIBULAR EXAMINATION.

Hearing:	Right Ear:	Absolute deafness.
	Left Ear:	Normal.
Spontaneous		
Phenomena:	Nystagmus	Looking straight ahead—horizontal to right.
		Looking to right—horizontal to right, marked.
		Looking to left—horizontal to left, slight.
		Looking up—combined vertical up and rotatory to left.
		Looking down—none.
	Past pointing	Right arm—2 to 4 inches to right.
		Left arm—touch.
	Falling	to right regardless of position of head.

- Rotation: To right: Nystagmus, horizontal to left, fair amplitude, 13, 14, 14 seconds' duration (repeated examinations).
Past pointing, correct direction, shortened duration each arm.
Vertigo, correct sensation, shortened duration (5 seconds).
- To left: Nystagmus, horizontal to right, poor amplitude, 13, 12, 12 seconds (repeated examinations).
Past pointing, right arm: correct direction, shortened duration and amplitude.
Left arm: none.
Vertigo, correct sensation, shortened duration (10 seconds).
- Caloric: Head forw'd 30 degrees. Water 68 degrees.
- Right Ear: Nystagmus, no change in the spontaneous type after 3½ minutes.
Past pointing, none.
Falling, none.
Head back, nystagmus, no change from spontaneous type.
Past pointing, none.
- Left Ear: Nystagmus, after 2 minutes, a very faint rotatory to right nystagmus appeared, poor amplitude.
Past pointing, none.
Falling, swaying to left.
Head back, nystagmus, horizontal to right, good amplitude.
Past pointing, correct both arms.
- Caloric: Repeated gave same results as above.

Summary of my report:

1. Absolute deafness right ear; left normal.
2. Rotation—all stimuli from left side indicate dead horizontal right canal or pathway.
3. Nonfunctionating right vertical canals or pathways.
4. Greatly impaired left vertical canals or pathways.
5. Normal left horizontal canal or pathway.

Conclusion: Cerebellopontine angle lesion right side. From the fact that the left vertical canals or pathways are not absolutely dead suggest either a small or fairly recent lesion."

Operation: By Dr. Naffziger. Findings: Neuroma right acoustic nerve.

Case V.—Harry V., Hospital No. 14046. First seen March, 1922. Complaint: About two years ago suddenly noticed hearing in right ear was defective. At the same time began to have attacks of vertigo and an unsteadiness of gait. The attacks of vertigo at first were intermittent. Would stagger to either side. These symptoms all gradually disappeared, and patient for a while apparently felt perfectly well. About five months ago attacks of vertigo reappeared—at first intermittent and transient. Lately they have increased in frequency and severity and are now accompanied by nausea and vomiting. During the attacks of vertigo the patient has a sensation of turning, but does not remember in which direction. Staggering is to either side. For the last two months has noticed a loss of sense of taste on right side of tongue, also loss of smell in right nostril, and that sensation on right side of face has been lost. Has experienced dull occipital and frontal headaches for the past week.

Physical examination, essentially negative.

Neurologic examination: Cranial nerves: I—Loss of smell on right side, left side normal.

II—Beginning atrophy each disc.

III, IV, VI—Negative.

V—Diminished pain, temperature and touch right side.

VII—Slight drooping right corner of mouth. Loss of taste anterior two-thirds right side.

VIII—See report.

IX, XII—Negative.

Preoperative diagnosis: Right cerebellopontine angle lesion.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: Absolute deafness.
Left Ear: Normal.

Spontaneous

Phenomena: Nystagmus Looking to right—horizontal to right.
Looking to left—none.

- Looking up—vertical upward.
Looking down—none.
- Past pointing none.
- Falling General swaying in all directions,
not influenced by change of position of head.
- Rotation: To right: Nystagmus, horizontal to left, good amplitude, 20 seconds' duration.
Past pointing, correct direction, shortened amplitude and duration each arm.
- To left: Vertigo, normal right to left.
Nystagmus, horizontal to right, fair amplitude, 13 seconds' duration.
Past pointing, right arm: correct direction, shortened amplitude and duration.
Left arm: none.
- Caloric: Head forw'd 30 degrees. Water 68 degrees.
- Right Ear: Nystagmus, none after 3 minutes.
Past pointing, none.
Vertigo, none.
Head back, nystagmus, none.
Past pointing, none.
- Left Ear: Nystagmus, horizontal (perverted) to left (perverted), good amplitude in 75 seconds (delayed).
Past pointing, right arm: to right (crossed).
Left arm: none.
Head back, nystagmus, horizontal to right, good amplitude.
Past pointing, correct both arms.

Summary: Right ear, absolute deafness.

Spontaneous vertical nystagmus suggests a lesion in or near the brain stem.

Rotation suggests that the stimulation is derived from the left horizontal canal; that the right horizontal canal is non-functionating.

The caloric tests show nonfunctionating right horizontal and

vertical canals and pathways. The left verticals give a perverted reaction—horizontal to left instead of rotatory to right.

The left horizontal canal and pathway are normal.

Diagnosis: Right cerebellopontine angle lesion.

Operation: Dr. Naffziger. Tumor verified.

Case VI.—Stuart H., private patient. First seen August, 1922. Complaint: Vertigo, nausea, vomiting, deafness in right ear. The patient was employed in one of the large mercantile houses here which maintains a medical department. Was referred to me for the vestibular examination with the following history: About two years ago trouble began with a "sort of fluttering and roaring and deafness in right ear accompanied by dizziness." Attacks lasted from a few seconds to a minute. These attacks have gradually increased until at the present time "roaring, dizziness and deafness have become constant." Nausea is frequent. About two weeks ago had a severe attack of nausea and vomiting. At this time was examined by a physician and told he had had a "hemorrhage into the right ear." Was sent home. Next morning, vomiting and nausea was increased and accompanied by dizziness and staggering. The following day was examined again and sent to hospital, where he remained for nine days. Nausea, dizziness and staggering gradually disappeared. Noises in ear somewhat less. "In hospital was physiologically scrutinized and many tests made." "Left hospital on August 24th and was examined next day. Deafness, noises and staggering continued unchanged. Ear was washed out. Next day was taken to —— Hospital and further tests made. Suggested that I go to work next day. Did so. Was examined again. No change."

As this patient was sent to me simply for the vestibular examination, no report can be given as to the physical or neurologic findings.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: Absolute deafness.
Left Ear: Normal.

Spontaneous

Phenomena: Nystagmus: Looking to right—slight horizontal to right.

Looking to left—none.

		Looking up—slight rotatory to right.
		Looking down—none.
	Past pointing	none.
	Falling	Swaying to right, regardless of position of head.
Rotation:	To right:	Nystagmus, horizontal to left, fair amplitude, 12, 10 seconds' duration (repeated examinations). Past pointing, correct direction, shortened amplitude each arm. Vertigo, shortened (10 seconds). Falling, subnormal.
	To left:	Nystagmus, horizontal to right, fair amplitude, 10, 9 seconds' duration (repeated examinations). Past pointing, none for either arm (repeated examinations). Vertigo, prolonged (35 seconds). Falling, normal.
Caloric:	Head forw'd	30 degrees. Water 68 degrees.
	Right Ear:	Nystagmus, none after 3 minutes. Past pointing, none. Vertigo, none. Falling, swaying to right. Head back, nystagmus, horizontal to left, very faint amplitude. Past pointing, none.
	Left Ear:	Nystagmus, none after 3 minutes. There were a few indefinite twitchings but no true nystagmus. Past pointing, none. Vertigo, none. Falling, none. Head back, nystagmus, horizontal to right, fair amplitude. Past pointing, normal each arm. Nausea, vomiting and sweating present. Head up, nystagmus disappears.

- Past pointing, none.
 Head forward 60 deg., nystagmus
 horizontal to left, good amplitude.
- Caloric: Second Examination:
 Left Ear: Nystagmus, none after 3 minutes.
 Past pointing, none.
 Vertigo, none.
 Falling, none.
 Head back, nystagmus, horizontal
 to right, marked amplitude.
 Past pointing, normal.
 Head up, nystagmus disappears.
 Past pointing, none.
 Head forward 60 deg., nystagmus
 horizontal to left, good amplitude.
- Caloric: Head forw'd 30 degrees. Water 68 degrees. Third
 Examination.

The same results for nystagmus, past pointing, vertigo
 and falling with the head in the various positions were
 obtained as in the previous examinations.

Summary: Right ear, absolute deafness.

Nonfunctionating right vestibular apparatus.

Nonfunctionating left vertical canals and pathways.

Normal left horizontal canal and pathway.

My report to the medical director of the patient's firm said:

"The previous diagnosis (hemorrhage into the right laby-
 rinth) would explain our findings as far as the right internal
 ear is concerned. It would not, however, explain the non-
 responsive condition of the left verticals. . . . We know
 . . . that these findings are suggestive of a right sided
 cerebellopontine angle lesion. . . . The patient should have
 the benefit of a complete neurologic examination with this
 diagnosis in view."

In trying to follow up the case recently, the results have been
 a little unsatisfactory. Inquiring at the medical department
 of this firm, I was told that the patient left their employ soon
 after this examination. The medical director to whom my
 report was sent had also left. The head nurse, however, en-
 deavored to find the final outcome of the case and reported to
 me as follows: "After leaving the firm, patient went to work

for another concern. A friend of his at this latter concern told the nurse that his symptoms continued and about a year ago was operated upon for a 'growth' of the 'right ear nerve.' Patient has since left the city and present condition or address is unknown."

This is as accurate a verification of the original diagnosis as can be submitted. But with the typical vestibular findings and the layman's diagnosis, I feel justified in including this case in the group of cerebellopontine angle lesions.

Case VII.—Richard S. Hospital Nos. P-16810A, S-16845. Age 10. Child entered pediatric service Oct. 18, 1922. Complaint: Right facial palsy, frontal headaches and locomotor instability. About eight months ago parents noted an indefinite instability and staggering in child's gait which had no relation to right or left side. Marked nervousness and irritability also present. About this time frontal headaches began which were fairly constant. Two months ago, beginning involvement of right facial nerves. For past two months speech has become slower and at times would hesitate as if at a loss for a word. Hearing in right ear has been gradually diminishing during past six months. For past three weeks attacks of vomiting, projectile in type, occurring from one to several times a day.

Physical examination negative.

Neurologic examination: Cranial nerves: I—Normal.

II—Beginning bilateral choked discs.

III, IV, VI—Negative.

V—Anesthesia right side of face, right corneal reflex absent; muscles mastication right side weak.

VII—Right side involved.

VIII—See vestibular report.

IX, XII—Negative.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: Absolute deafness.

Left Ear: Normal.

Spontaneous

Phenomena: Nystagmus Looking straight ahead—none.
Looking to right—marked horizontal to right.
Looking to left—marked horizontal to left.

		Looking up—combined vertical upward and oblique to left.
		Looking down—rotatory to left.
	Past pointing	none.
	Falling	To left regardless of position of head.
Rotation:	To right:	Nystagmus, horizontal to left, irregular amplitude, 18 sec. duration.
		Past pointing, correct direction, shortened amplitude.
	To left:	Nystagmus, horizontal to right, irregular amplitude, 17 seconds' duration.
		Past pointing, correct direction, shortened amplitude.
Caloric:	Head forw'd	30 degrees. Water 68 degrees.
	Right Ear:	Nystagmus, none after 4 minutes.
		Past pointing, none.
		Vertigo, none.
		Falling, none.
		Head back, nystagmus, none.
		Past pointing, none.
	Left Ear:	Nystagmus, none after 4 minutes.
		Past pointing, none.
		Vertigo, none.
		Falling, none.
		Head back, nystagmus, horizontal to right, good amplitude.
		Past pointing, right arm, none.
		Left arm, correct.

Summary: Absolute deafness right ear.

Nonresponsive vestibular apparatus, right side.

Nonresponsive left vertical canals.

Responsive left horizontal canal.

Diagnosis: Right cerebellopontine angle lesion.

Child was transferred to surgery.

Operation: By Dr. Naffziger. Operative report: ". . . .

The cerebellum was explored in all directions. No surface tumor was seen and there was no dislocation of the midline lateralward. Puncture of the cerebellar hemisphere was negative, and on account of the patient's poor condition no ex-

tensive exploration of the angles was made, as any removal would have been out of the question."

Child died. Autopsy: Right cerebellopontine angle lesion. Glioma. (Dr. Rusk.)

Case VIII.—Jack H. Hospital File Nos. 16928, 17477, 17973, 19677. First seen October, 1922. Complaint: Headaches, vomiting, blurring of vision and dizziness. About six weeks before, began with vomiting attacks, projectile in type, and not associated with nausea. Two weeks ago began to have frontal headaches. During the last week has developed attacks of vertigo and diplopia. (On account of age of patient—10 years—an accurate history was impossible.)

Physical examination negative.

Neurologic examination: Cranial nerves: I—Normal.

II—Bilateral choked discs.

III, IV, VI—Nystagmus (see vestibular report), paralysis right VI nerve with diplopia.

V, VII—Normal.

VIII—See report.

IX, XII—Normal.

Von Pirquet and Wassermann negative.

Impression: Right cerebellopontine angle lesion. Right intrapontine lesion.

VESTIBULAR EXAMINATION.

Hearing: Practically normal each ear.

Spontaneous

Phenomena: Nystagmus Looking straight ahead—vertical upwards.

Looking to right—horizontal, to right.

Looking to left—horizontal to left.

Looking down—none.

Looking up—vertical upward.

Past pointing none.

Falling General swaying, regardless of position of head.

Rotation: To right: Nystagmus, horizontal to left, good amplitude, 22 seconds' duration.

Past pointing, normal each arm.

- To left: Nystagmus, horizontal to right, amplitude, 22 seconds' duration.
Past pointing, normal each arm.
- Caloric: Head forw'd 30 degrees. Water 68 degrees.
- Right Ear: Nystagmus, combined rotatory to left and oblique upwards and to left, good amplitude in 53 sec.
Past pointing, normal each arm.
Head back, nystagmus, combined horizontal to left and oblique upward to left.
Past pointing, normal each arm.
- Left Ear: Nystagmus, combined rotatory to right and oblique upward and to right, good amplitude in 46 sec.
Past pointing, none for either arm.
Vertigo, none.
Head back, nystagmus, horizontal to right, good amplitude.
Past pointing, none for either arm.

In November, 1922, my report said:

"1. Hearing normal in each ear.

2. The spontaneous nystagmus gives no localizing information except that the vertical nystagmus is suggestive of a brain stem lesion.

On rotation, the reactions are normal; this would suggest uninvolved medulla. In the caloric examination, we have a perverted nystagmus (combined rotatory and oblique). In the examination of the right side this perverted nystagmus is present, both from the horizontal and vertical canals; in the examination of the left side it is present only from the vertical canals. These findings would suggest a right sided brain stem lesion in the region of the angle."

Operation: By Dr. Naffziger. Decompression and exploratory. (November, 1922.)

Operation report: ". . . . There was a marked herniation of the cerebellum into the foramen magnum. The dura was opened widely in all directions. Punctures of both cerebellar hemispheres were made and were negative. The patient's signs pointed to a lesion in the right cerebellopontine angle but

on account of the small size of the patient it was thought best not to submit to any longer operation."

The patient was discharged from the hospital December 19, 1922, with instructions to report to the Out Patient Department. He again entered the hospital on January 5, 1923, complaining of fever and drowsiness. For the last two or three days has been feeling "dopy" and running a temperature between 101 and 103.

Progress since leaving the hospital, December, 1922. "Child plays in the mornings but tires towards noontime. Rests practically all afternoon. Has had practically no headaches or vomiting recently except for the past three days."

Entry note: "There is nothing in the ears, chest or urine to account for the fever."

Neurologic examination: Unchanged from previous examination.

Considerable bulging over area of suboccipital decompression.

January 17, 1923. Ventricular puncture; 60 c. c. of clear, colorless fluid removed under slightly increased pressure.

January 28, 1923. Discharged with instructions to report for X-ray treatments. Condition on discharge—not improved.

May 7, 1923. Reentered hospital. Examination at this time showed no changes in previous examination except that patient was more apathetic.

Operation: By Dr. Naffziger—two stages.

Operation findings: Large, soft, somewhat lobulated tumor of right cerebellopontine angle. Death.

Pathologic report: Glioma.

In this case, the localization of the lesion was suggested seven months (November, 1922) before it was verified (May, 1923).

Case IX.—May S. Hospital Nos. S-21866, S-22376. First seen September, 1923. Complaint: Three and a half years ago, when patient was seven months pregnant, one night had sudden fainting spell, followed by headache, dizziness and black spots before her eyes. One month later, had fever and slight cough. In bed two weeks. Was pronounced "influenza." After delivery, was weak and noticed a numbness and tingling on right side of face with "lifelessness" of right side of body. Since then has had two other children with exacerbation of

symptoms at the time of delivery. At other times has felt better. For the past year has had pain in lower back which extends upwards, ending in head. Blind spells lasting ten to twelve seconds. Three years ago first noticed attacks of vertigo. These attacks came on suddenly, especially with change of position of head. No nausea or vomiting present. During attacks the external objects appear to turn but patient cannot tell the direction. Staggering present, usually to right. At times has fallen forward. Has noticed diminution of hearing in right ear. Cannot tell when this began, but it is gradually increasing. Intermittent tinnitus in right ear.

Physical examination negative.

Neurologic examination: Cranial nerves: I—Negative.

II—Bilateral choked disc.

III, IV, VI—Diplopia six months ago. Rotatory nystagmus.

V—Numbness and tingling right side of face. Sensation to pain, temperature and touch diminished on right side. Absent corneal reflex (right).

VII—Right orbicularis does not close eye completely. Loss of taste anterior two-thirds of tongue, right side.

VIII—See vestibular report.

IX—Some difficulty in swallowing. Regurgitation of food through nose. Gag reflex absent on right side.

X, XI, XII—Negative.

Somatic: Hyperesthesia to touch and pain on right.

Hyperesthesia to temperature on right.

Reflexes increased on right side.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: Absolute deafness.
Left Ear: Normal.

Spontaneous

Phenomena: Nystagmus Looking straight ahead—intermittent rotatory to left.
Looking to right—none.
Looking to left—none.
Looking up—combined vertical up and rotatory to left.
Looking down—slight vertical downward.

Past pointing none.

	Falling	Swaying to right, regardless of position of head.
Rotation:	To right:	Nystagmus, horizontal to left, good amplitude, 21 seconds' duration. Past pointing, correct direction, shortened amplitude each arm. Vertigo, shortened (7 seconds).
	To left:	Nystagmus, horizontal to right, good amplitude, 12 sec. duration. Past pointing, correct direction, shortened amplitude each arm. Vertigo, shortened (8 seconds).
Caloric:	Head forw'd	30 degrees. Water 68 degrees.
	Right Ear:	Nystagmus, none after 3 minutes. Past pointing, none. Vertigo, none. Falling, none. Head back, nystagmus, none. Past pointing, none.
	Left Ear:	Nystagmus, none after 3 minutes. Past pointing, right arm none. Left arm, correct direction, shortened amplitude. Vertigo, none. Falling, none. Head back, nystagmus, horizontal to right, marked amplitude. Past pointing, right arm none.
		Left arm normal.

My report said: "Absolute deafness right ear.
Nonfunctionating vestibular apparatus right side.
Nonfunctionating vertical canal and pathways left side.
Normal horizontal canal and pathway left side.
This syndrome is suggestive of cerebellopontine angle lesion right side."

Operation: Tumor of right acoustic nerve. Certified at operation.

SUPRATENTORIAL LESIONS.

The aid in the localization of supratentorial lesions is one of the later developments of neurootology. In our interpreta-

tion of the findings in this type of case we must realize that the symptoms are due to the effect of an indirect pressure upon the vestibular pathways.

The findings usually come under one of two groups—either an early irritative condition, in which all the responses are exaggerated, or a later group in which, due to long continued pressure, the responses are either greatly diminished or even absent. If this pressure is exerted chiefly on the upper portion of the brain stem, we find that the responses from the vertical canals on one or both sides are affected.

Barany has emphasized the fact that, due to pressure on the cerebellum, we often have an impairment of the outward past pointing of the arm which may even reach such a degree as to lead to a cross past pointing.

Lyons, in an article "Barany Tests in Supratentorial Tumors Proved by Operation or Necropsy" (*ANNALS OF OTOL-
OGY, RHINOLOGY AND LARYNGOLOGY*, December, 1920), says:

"In general, there are two large groups of phenomena syndromes that are typical of supratentorial tumors. The first group shows a very clear and marked response of nystagmus, vertigo, falling and past pointing. . . . Symptoms of the second large group, while not so common, are just as typical of cerebral tumor as those of the first group. There is clearly an active response of the nystagmus from one set of canals only, associated with an interference with the tracts in the stem or peduncles, and giving rise to diminished responses or to absence of responses ordinarily attributed to these areas. In other words, the predominating feature, aside from an early and exaggerated nystagmus, may be the responses due to pressure. . . . In order to make clear the relative position of the Barany in tumors localized in the cerebrum, it will only be necessary to state that the diagnosis of the location of an intracranial lesion by this test is determined by the neurologist. Hence, the final location of such a tumor is made by the neurologist, who considers all symptoms and signs, including the Barany test."

In the following five cases of supratentorial lesions, the neurologic findings fall into both group syndromes, as outlined by Lyons.

Case X.—Wm. M. File No. 11995. First seen January, 1921. Complaint: Difficulty in walking; pain in right leg. Patient claims he was perfectly well until two years ago. While hunting in the hot sun had a sudden feeling of "light headedness," fell and was unconscious for fifteen minutes. Did not bite his tongue. Felt perfectly well again within an hour. Had a similar attack about six months ago while at home. Between these two attacks has experienced several attacks of vertigo. These attacks would come on suddenly, were of an intermittent type and lately have become less frequent and less severe. Has never had any nausea or vomiting. Has noticed a tendency to stagger to the right. No trouble with hearing. No tinnitus. After the second attack noticed pain in the posterior portion of right thigh. This pain would come and go. Gradually there has developed a dragging sensation of right leg and a certain difficulty in raising it in walking. Had a history of a primary lesion some years ago, for which lately he has had antiluetic treatment but without improvement of his symptoms. Memory not so good as formerly. Lately vision has begun to fail.

Examination: Wassermann two plus. Romberg marked, but to no particular side.

Cranial nerves: I—Normal.

II—Bilateral choked disc.

III, VII—Normal.

VIII—See report.

IX, XII—Normal.

Reflexes all lively. No Babinski or Oppenheimer. Gait definitely ataxic.

VESTIBULAR EXAMINATION.

Hearing: Practically normal on each side.

Spontaneous

Phenomena: Nystagmus none.

Past pointing none.

Falling Always to right, regardless of position of head.

Rotation: To right: Nystagmus, marked horizontal to left, 40, 30, 30 seconds' duration (repeated examinations).

Past pointing, correct direction, but

		exaggerated amplitude and duration each arm.
		Vertigo, normal sensation, prolonged duration.
	To left:	Nystagmus, marked horizontal to right, 27, 20, 18 seconds' duration.
		Past pointing, correct direction but exaggerated amplitude and duration each arm.
		Vertigo, correct sensation but slightly prolonged.
Caloric:	Head forw'd	30 degrees. Water 68 degrees.
	Right Ear:	Nystagmus, marked rotatory to left in 24 seconds.
		Past pointing, correct direction but exaggerated amplitude.
		Falling, marked to right.
		Head back, nystagmus, marked horizontal to left.
		Past pointing, exaggerated.
	Left Ear:	Nystagmus, marked rotatory to right in 26 seconds.
		Past pointing, exaggerated both arms.
		Falling, marked to left.
		Head back, nystagmus, marked horizontal to right.
		Past pointing, exaggerated each arm.

The following is taken from my report: "Normal cochlea; marked hypersensitiveness or irritative condition of all vestibular pathways on each side. The fact that all stimuli from all canals on both sides appear would suggest that we have no destruction or block of the vestibular pathways on either side. They would further suggest as positive findings in regard to localization:

- (a) Uninvolved end organ or labyrinth.
- (b) Uninvolved medulla, pons and cerebellum, and is strongly suggestive that, whatever lesion is present, it is not in the posterior fossa.

- Past pointing, exaggerated amplitude and duration each arm.
- To left: Nystagmus, horizontal to right, marked amplitude, duration 43 sec.
Past pointing, exaggerated amplitude and direction each arm.
- Caloric: Head forw'd 30 degrees. Water 68 degrees.
- Right Ear: Nystagmus, rotatory to left, marked amplitude in 45 seconds.
Past pointing, normal.
Head back, nystagmus, horizontal to left, good amplitude.
Past pointing, exaggerated each arm.
- Left Ear: Nystagmus, rotatory to right, marked amplitude, in 35 seconds.
Past pointing, normal each arm.
Head back, nystagmus horizontal to right, good amplitude.
Past pointing, exaggerated each arm.

Summary: Normal hearing each side. All reactions to all stimuli from all canals on each side go through, indicating there is no block or interruption in the vestibular pathways. This would suggest uninvolved cerebellum, pons and medulla, as far as vestibular pathways are concerned.

There is a definite exaggeration of the reactions, particularly of the horizontal canals. From past experience, this is suggestive of a supratentorial lesion but without value as to localization.

Preoperative diagnosis: Brain tumor, probably in right parietal region.

Operation: By Dr. Naffziger. Tumor right parietal region.

Pathologic report by Dr. Rusk: Dural endothelioma with extensive depressions in subjacent frontal, parietal and temporal opercula on right side.

Case XII.—Mike P. Hospital File Nos. M-14176, M-14713, S-14488, M-15857. First seen April, 1922. Complaint: Headaches, nausea, vomiting, paresis left arm. About six months

ago, left arm suddenly became paralyzed. Four days later "jaw locked for six or seven hours." The following week headaches began. The headaches were first localized in the frontal region but gradually became generalized. At first, patient experienced some relief, but lately they have become more severe and constant. During the past month has had about four attacks of diplopia, each attack lasting about ten minutes. Last two weeks, nausea and projectile vomiting. Vision has been gradually failing—this failure being more marked in right eye. Patient first noticed attacks of vertigo late in 1921. These attacks would come on suddenly and were transient. They were more marked by a sudden change of position of body. Noticed that the external objects seemed to turn from left to right. About the same time that the attacks appeared patient noticed that he had a tendency to stagger to the right. Has never fallen. Has noticed some trouble with hearing but cannot tell when it began. Worse in left ear. Tinnitus has developed within the last six months. Has now become constant and is worse in left ear.

Physical examination negative.

Neurologic examination: Cranial nerves: I—Normal.

II—Bilateral choked discs (beginning).

III, IV, V, VI—Normal.

VII—Normal. While under observation in hospital, developed a left facial paralysis.

VIII—See report.

IX, XII—Normal.

Paresis left arm with hypoaesthesia of left arm and hand.

Diagnosis : Tumor motor area for left arm and face.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: normal.
Left Ear: some diminution, slight and of nerve type.

Spontaneous

Phenomena: Nystagmus none.

Past pointing none.

Falling none.

Rotation: To right: Nystagmus, horizontal to left, marked amplitude, 26 seconds' duration.

- Past pointing, right arm exaggerated. Left arm not tried.
Vertigo, normal right to left.
- To left: Nystagmus, horizontal to right, marked amplitude, 22 seconds' duration.
Past pointing, right arm exaggerated. Left arm not tried.
Vertigo, normal left to right.
- Caloric: Head forw'd 30 degrees. Water 68 degrees.
- Right Ear: Nystagmus, rotatory to left, marked amplitude in 55 seconds.
Past pointing, right arm correct.
Left arm not tried.
Vertigo, correct right to left.
Head back, nystagmus horizontal to left, good amplitude.
Past pointing, right arm correct.
Left arm not tried.
- Left Ear: Nystagmus rotatory to right, faint amplitude in 50 seconds.
Past pointing, right arm correct.
Left arm not tried.
Vertigo, correct.
Head back, nystagmus horizontal to right, fair amplitude.
Past pointing, right arm none.
Left arm not tried.

My report read:

- "1. Practically normal hearing both ears.
2. All reaction from all canals on each side appear, with the exception of absent past pointing of right arm in the caloric examination of left ear with the head back. The reaction of the left arm could not be tested on account of the paralysis.
3. The presence of all of these reactions would, per se, suggest that the medulla, pons and cerebellum, at least as far as the vestibular pathways are concerned, are not involved.
4. The exaggerated nystagmus and past pointing of right arm are suggestive of possible supratentorial lesion."

Operation: By Dr. Naffziger. Subcortical tumor in right motor area.

Pathologic report (Dr. Rusk): Metastatic papillary adenocarcinoma.

Case XIII.—Amy D. Hospital File Nos. 10086, 17013. First seen February, 1921. A year before had consulted her physician for pains in the back and swelling of the limbs. At that time showed no neurologic changes. Was diagnosed as arteriosclerosis, hypertension with hypertrophic arthritis and ductless gland dystrophy. Certain tender fat pads suggested Dercum's disease. At this time noticed some failure of vision. Was seen by an oculist, who gave patient glasses which gave a certain amount of relief. Vision has failed considerably lately. Has suffered with headaches since the age of nine years. They are chiefly over the right parietal and occipital regions. At first, headaches would come about once every three months. During the past year they have become more frequent and more severe, often lasting a couple of days. The first attacks of vertigo occurred about seven years ago. The attack would come on suddenly, without warning. Had the sensation of external objects rotating rather than herself, but is unable to tell in which direction. Nausea and vomiting are present during these attacks. Tendency to stagger, but in no particular direction. Staggering has increased during the last couple of years. Has fallen several times but to no particular side. Has noticed some diminution of the hearing, especially in right ear, during the last year. This has come on gradually and is increasing. Tinnitus in the right ear, which began about the same time, and is intermittent.

Previous to entrance into hospital had been diagnosed tumor of the pituitary body.

Physical examination practically negative.

Neurologic examination: At present is hyperirritable. There is some tenderness over right parietal region. Motor power is apparently a little diminished—the left stronger than the right in both extremities. No astereognosis or disturbance of muscle sense. No changes in the reflexes.

Cranial nerves: I—Normal.

II—Bilateral choked discs.

III, IV, VI—Negative.

V—Slight hyperesthesia left side of jaw.

VII—Negative.

VIII—See report.

IX, XII—Negative.

X-ray of skull shows increased vessel markings over entire calvarium with slight thinning and atrophy of the posterior clinoid processes.

VESTIBULAR EXAMINATION.

Hearing: Slight diminution in hearing both ears, of nerve type, more marked in right ear.

Spontaneous

Phenomena: Nystagmus none.

Past pointing none.

Falling none.

Rotation: To right: Nystagmus, horizontal to left, fair amplitude, 30 seconds' duration. At times there was a conjugate deviation of eyes to right.

Past pointing, normal.

Vertigo, normal.

Nausea, marked.

To left: Nystagmus, horizontal to right, good amplitude, 33 seconds' duration.

Past pointing, normal.

Vertigo, normal.

Nausea, marked.

Caloric: Head forw'd 30 degrees. Water 68 degrees.

Right Ear: Nystagmus, none after 4 minutes.

Past pointing, none.

Vertigo, none.

Head back, nystagmus horizontal to left, fair amplitude but short duration.

Past pointing, correct each arm.

Left Ear: Nystagmus, in 90 seconds there appeared a faint rotatory nystagmus to right. While it was definite, it was not constant.

Past pointing, right arm correct.

Left arm none.

Head back, nystagmus horizontal to right, good amplitude.

Past pointing normal each arm.

My report, in part, said:

"On rotation to right, nystagmus of typical type present, showing that the stimuli go through. However, the tendency to conjugate deviation to right suggests that the vestibular component is unimpaired but that the cerebral component is interfered with at times. This would be somewhere in the course between the cerebral cortex and the eye muscle nuclei. In the caloric examination of the right ear, no nystagmus or past pointing after four minutes. This suggests block of the pathways of the vertical canals on right side. The delayed reaction and atypical type of nystagmus from the left verticals suggest an impairment of this tract. From an otologic viewpoint, these results suggest a right sided lesion."

Preoperative diagnosis: Tumor posterior fossa.

Operation: By Dr. Naffziger. Cerebellar decompression, exploration of cerebellum and angles. Result negative.

X-ray treatments recommended.

Following the cerebellar decompression and X-ray treatments, the patient was much improved for a while.

Reentered the hospital in October, 1922, with a return of the previous symptoms, loss of memory and more irritable.

At this time, I regret that a second vestibular examination was not done so that the results could be checked.

Operation (second). By Dr. Naffziger. Endothelioma of dura over right parietal region.

In this case, although a supratentorial lesion was not suggested in my report, the side of the lesion was suggested a year and a half before it was verified by operation.

As I review this case, in the light of our present knowledge of the reactions in supratentorial lesions, I realize that with the vertical canal findings I missed the opportunity to suggest a supratentorial lesion, even against a neurologic diagnosis of posterior fossa tumor.

Case XIV.—Nick B. Hospital File No. 10363. First seen September, 1921. In December, 1918, following an attack of

influenza, patient began to have severe headaches in the frontal region. These headaches would radiate to the occipital region and were worse on the left side. Gradually became more severe and frequent, and at times were accompanied by vomiting and a feeling of general weakness. About five months after the first of these attacks he noticed a beginning failure in vision, which has gradually progressed. During the last six months, has had peculiar nocturnal attacks. The patient would be awakened by a feeling of coldness in his feet, which sensation would gradually travel up the spine to his head. This feeling was more marked on the right side. These attacks would wear off in one to two hours, leaving him very weak. During two of such attacks he lost consciousness but does not know for how long. No history of convulsive movements. During the last four months he has noticed a gradually increasing weakness in the right leg.

Neurologic examination: Cranial nerves: I—Normal.

II—Bilateral optic neuritis.

III, VII—Normal.

VIII—See vestibular report.

IX, XII—Normal.

Wassermann negative. Gait somewhat spastic. No Romberg. Coordination good. No astereognostic disturbances. Some weakness of right leg movements and beginning weakness in right arm.

Preoperative diagnosis: Brain tumor in region of motor area, near vertex, left side. Vestibular examination to rule out a possible posterior fossa lesion.

VESTIBULAR EXAMINATION.

Hearing: Both ears somewhat diminished, more marked on left side and of nerve type.

Spontaneous

Phenomena: Nystagmus none.

Past pointing none.

Falling none.

Rotation: To right: Nystagmus, horizontal to left, marked amplitude but somewhat irregular, 24 seconds' duration. Past pointing, normal direction, prolonged duration.

	To left:	Nystagmus, horizontal to right, marked amplitude but somewhat irregular, 26 seconds' duration. Past pointing, normal direction, prolonged duration.
Caloric:	Head forw'd	30 degrees. Water 68 degrees.
	Right Ear:	Nystagmus, rotatory to left, marked amplitude in 65 seconds. Past pointing, exaggerated. Vertigo, normal right to left. Head back, nystagmus horizontal to left, good amplitude. Past pointing exaggerated.
	Left Ear:	Nystagmus, rotatory to right, faint amplitude in 58 seconds. Past pointing, normal. Vertigo, normal left to right. Head back, nystagmus horizontal to right, good amplitude. Past pointing, normal.

Summary: 1. There is a slightly diminished hearing on both sides—more marked on left, and of nerve type.

2. Rotation—motor and sensory responses to stimuli somewhat exaggerated.

3. Caloric—motor and sensory responses to stimuli somewhat exaggerated (right side).

Conclusions: All responses to all stimuli from all canals on each side appear. These findings would suggest uninvolved medulla, pons and cerebellum, at least as far as the vestibular pathways are concerned.

Operation: By Dr. Naffziger. Findings: Area of leptomeningitis over leg area on left side. No growth.

The following case, when the patient came to autopsy, was rather a disappointment to me because I had felt that we had definite left sided lesion. As I review the findings now, in the light of our more recent knowledge and the conservatism gained by past experience, I feel that the original diagnosis of 1919 would be different today and that I would probably be satisfied, with such varied findings, to simply suggest a brain stem lesion and not attempt a more definite localization.

However, there is the satisfaction, even in the original examination, of stating that we had a brain stem lesion when the neurologic findings were not sufficient to give any localizing data and the patient was discharged from the hospital, and it was a period of five months or so before symptoms sufficient to locate a posterior fossa lesion.

Case XV.—Harry S. Hospital Files M-4704, S-4704. First seen October, 1919. Complaint: Dizziness, nausea, vomiting. Patient was well until four or five years ago, when he first noticed dizziness with sharp pains the back of his head. These attacks, lasting ten to fifteen minutes, would come on at irregular intervals, varying from a week to several months. About the same time patient began to feel "lazy and dull and had no ambition." The vertigo has become more or less constant and more severe. It is made worse by a sudden change of position of the head or body. Patient has noticed that he experiences a sensation of turning from left to right. Nausea and vomiting are often present. These symptoms began about nine months ago and have become more frequent. Vomiting is not projectile in type. While there is a feeling of unsteadiness, staggering is only present at times, and then to no particular side. Has never been severe enough to cause him to fall. Has had no trouble with the hearing or tinnitus. For the past few weeks, severe left occipital and temporal headaches. Vision, especially of right eye, has gradually failed.

Physical examination negative.

Neurologic examination: Cranial nerves: I—Normal.

II—Beginning edema each disc.

III, VII—Negative.

VIII—See vestibular report.

IX, XII—Negative.

Sensation: No changes.

Gait: Unsteady but no typical ataxia.

VESTIBULAR EXAMINATION.

Hearing: Normal, both ears.

Spontaneous

Phenomena: Nystagmus Looking straight ahead—none.
 Looking to right, slight horizontal
 and at times rotatory to right.
 Looking to left, none.

		Looking up, at first slight vertical upward, changing to rotatory to right.
		Looking down, at first slight vertical downward, changing to rotatory left.
	Past pointing	Right arm, at times to left. Left arm none.
	Romberg	Swaying to left, regardless of position of head.
Rotation:	To right:	Nystagmus, horizontal to left, faint amplitude, 20 seconds' duration. Past pointing, right arm at first correct direction, then to touch and then (crossed) to left. Left arm normal.
	To left:	Falling, none. Nystagmus, horizontal to right, good amplitude, 38 seconds' duration (prolonged). Past pointing, normal each arm. Falling, normal.
Caloric:	Head forw'd	30 degrees. Water 68 degrees.
	Right Ear:	Nystagmus, horizontal (perverted) to left, good amplitude in 48, 50 seconds. At times a rotatory element was present, but faint and inconstant. Past pointing, correct direction each arm. Vertigo, correct right to left. Head back, nystagmus horizontal to left, fair amplitude. Past pointing, correct direction each arm.
		Head up, nystagmus changes to horizontal to right.
	Left Ear:	Nystagmus, horizontal (perverted) to right, good amplitude in 30, 45 seconds.

Past pointing, correct direction each arm.

Vertigo, correct left to right.

Head back, nystagmus horizontal to right, good amplitude.

Past pointing, right arm correct direction. Left arm none.

Head up, nystagmus continues horizontal to right.

My report said:

"No diagnosis can be made, as far as the location of the lesion (or lesions) is concerned. The only definite information these tests give is that we have a brain stem lesion and not a labyrinthine. In favor of the brain stem lesion is the spontaneous vertical nystagmus and the perverted and inverted nystagmus on douching. As this perverted nystagmus is present only on testing the vertical canals, would venture a diagnosis of a lesion in the pons."

History note (October 28, 1919). "Patient discharged. To report to nerve clinic for further observation. Operation at present not advisable, as localizing symptoms are not definite enough. Diagnosis: Brain tumor."

Patient reentered hospital in February, 1920. During the interval between his first discharge and reentrance into the hospital (about five months) the staggering has become more marked and is now chiefly towards the right side. There is some dragging of the toes and a tendency to stumble. The vertigo has increased in frequency and severity, and patient still has sensation of turning from left to right. Headaches have become more severe.

Physical examination still essentially negative.

Neurologic examination: Cranial nerves: I—Normal.

II—Edema both discs.

III, IV, VI—No diplopia or twitching of lids. Pupils equal, react to light and distance. At times tendency to internal squint right eye.

V—Motor, right side of face smoother, no loss of power of muscles. Sensory touch less on right. Corneal reflex less on right.

VII—Normal.

VIII—See report.

IX—Some difficulty in swallowing.

X, XII—Normal.

Sensation, no change. Motor, staggering gait, no atrophies, slight degree of spasticity right side.

VESTIBULAR EXAMINATION.

Hearing: Normal each ear.

Spontaneous

Phenomena: Nystagmus Looking straight ahead—none.
Looking to right, faint horizontal to right.
Looking to left—none.
Looking up—combined vertical upward and rotatory to right.
Looking down—rotatory to right.

Past pointing none.

Falling Swaying to right, regardless of position of head.

Rotation: To right: Nystagmus, horizontal to left, good amplitude 17, 16 seconds' duration.

Past pointing, right arm—correct first and then cross to left. Left arm normal.

Vertigo, prolonged (61 seconds).

To left: Nystagmus, horizontal to right, marked amplitude 35, 35 seconds' duration.

Past pointing, correct both arms, although left arm shows a tendency to quickly come to touch and then to cross to right.

Vertigo, prolonged (65 seconds).

Caloric: Head forw'd 30 degrees. Water 68 degrees.

Right Ear: Nystagmus, now have a rotatory to left with a slight horizontal element, fair amplitude in 45, 55 sec.
Past pointing, correct each arm.

Head back, nystagmus horizontal to left, good amplitude.

Past pointing, correct both arms.

Left Ear: Nystagmus, horizontal (perverted) to right, good amplitude in 30 seconds.

Past pointing, correct each arm.

Head back, nystagmus horizontal to right, good amplitude.

Past pointing, right arm correct.

Left arm none.

Second

Examint'n: Left Ear: Same results.

Third

Examint'n: Left Ear: Head back 30 degrees as primary position. Water 68 degrees.

Nystagmus, the spontaneous horizontal nystagmus to right was increased in 10 seconds.

Past pointing, right arm correct.

Left arm none.

Head back, nystagmus horizontal to right reappears.

Head up, nystagmus disappears.

This was repeated several times with the same results—no nystagmus with the head up, horizontal nystagmus to right with head back.

Fourth

Examint'n: On account of the spontaneous horizontal nystagmus to right, water at 112 was used—head back 60 degrees as primary position.

Left Ear: Nystagmus, horizontal to left, good amplitude in 33 seconds.

Past pointing, correct each arm.

Head up, nystagmus changes to spontaneous horizontal to right.

My report, in part, read:

"The difference in time of the nystagmus on rotation (17 to left and 35 to right) would suggest a block of the left hori-

zontal tract; there is not a complete block, however, as we do obtain a reaction from the left horizontal on douching. The difference can be explained by an impairment of the tract on the left side (possibly pressure) with stimulation on the right side (irritation).

The perverted (horizontal) nystagmus from the left vertical canals can be explained by some lesion in the region of the posterior bundle interfering with the stimulus from the left vertical canals to the proper eye muscle nuclei via the posterior longitudinal bundle.

The fact that the patient past points correctly to both right and left with both arms shows that the tracts for vertigo from both the horizontal and vertical canals are functioning, and this would suggest, *per se*, that the cerebellum is not involved.

As the chief variations of the tests are confined to the nystagmus pathway of the left vertical, these tests would suggest a lesion on the left side in the region of the pons towards the median line."

Preoperative diagnosis: Cerebellar tumor.

Operation: By Dr. Naffziger. Patient died on the operating table.

Autopsy report (Dr. Rusk): "Endothelioma of dura centered over right side of medulla, extending from and compressing lower edge of pons, under surface of cerebellum and extending up and around medulla to just beyond midline underlying vermis, causing stretching of 7th, 8th, 9th, 10th, 11th and 12 nerves."

The following two cases are presented to show the value of neurotologic localizations. In the first case (Elizabeth C.) neurologic data pointed to a right cerebellar lesion. The vestibular tests suggested a left side posterior fossa lesion which operation proved correct.

The second case (Helen G.) was particularly interesting to me. It appeared to be a rather definite picture, according to the views then held. I made a "pin point" diagnosis, which luckily proved correct, although the neurologists would not go so far as the report shows. Aside from my good fortune in the localization of this case, it is one which has satisfied me more than any other that there is a definite differentiation of the tracts from the horizontal and vertical canals. I have been

kindly but severely criticized in regard to this case for making a diagnosis as an otologist, which a neurologist would hesitate to make. This diagnosis was made during the period which might be termed the "period of overenthusiasm," and I doubt if I would dare make such a diagnosis at the present time. However, the case is on record and, as Shakespeare says, "All's well that ends well."

Case XVI.—Elizabeth C. Hospital No. 10681. First seen in April, 1921. Complaint: Headaches and failing vision. Began in 1919 with severe generalized headaches and vomiting spells. Treated for "stomach trouble" but without improvement. In 1920, was operated upon for intestinal adhesions and chronic appendicitis with no improvement of symptoms. Headaches gradually became more severe and vomiting more frequent. Vision has gradually failed. Beginning early in 1920, noticed attacks of vertigo. These attacks would come on suddenly and have become more frequent and more severe during the last few months. Patient has a sensation of rotation but cannot tell in which direction. Staggering has developed and she has fallen at least three times—each time to the right. Has noticed no trouble with the hearing and no tinnitus.

Physical examination negative.

Neurologic examination: Cranial nerves: I—Normal.

II—Marked bilateral choked disc.

III, IV, VI—Nystagmus (see report); otherwise negative.

V—Numbness and itching on right side of face for last five months. Diminished pain and touch right side of face. Motor phenomena equal both sides. Corneal reflex absent on right, sluggish on left.

VII—Right side of face less wrinkled and slightly less expressive than left, but no muscular weakness made out on forced movements. Taste normal.

VIII—See report.

IX, X, XII—Normal.

Lobes: Frontals—No change in habits. Has become more irritable. No difficulty in orientation.

Temporoparietal—Occasionally is unable to remember a name or call for an article she wants. No uncinate fits.

Parietal—Slight muscular weakness left arm; no paralysis.

Occipital—No marked alteration in fields.

Posterior fossa—Vomiting since onset of symptoms. Head-aches severe and lately localizing in occipital region. No asynergia. Nystagmus present.

Preoperative diagnosis: Right cerebellar tumor.

VESTIBULAR EXAMINATION.

Hearing: Right Ear: There is a slightly diminished hearing of nerve type.

Left Ear: Normal.

Spontaneous

Phenomena: Nystagmus Looking to right—faint horizontal to right.

Looking to left—none.

Looking up—vertical upwards.

Looking down—none.

Past pointing none.

Falling Always to right, regardless of position of head.

Rotation: To right: Nystagmus, horizontal to left, good amplitude, 20 seconds' duration.

Past pointing, normal both arms.

To left: Nystagmus, horizontal to right, good amplitude, 23 seconds' duration.

Past pointing, normal both arms.

Caloric: Head forw'd 30 degrees. Water 68 degrees.

Right Ear: Nystagmus, rotatory to left, good amplitude in 39 seconds.

Past pointing, normal each arm.

Vertigo, normal right to left.

Head back, nystagmus horizontal to left, good amplitude.

Past pointing, normal each arm.

Left Ear: Nystagmus, rotatory to right, faint amplitude in 43 seconds.

Past pointing, none for either arm.

Vertigo, none.

Head back, nystagmus horizontal to right, good amplitude.

Past pointing, correct each arm.

In my report, I said:

"The findings would suggest an impaired left vertical canal pathway, as evidenced by a faint amplitude of the nystagmus and absence of vertigo and past pointing in the caloric examination of the left canals. These findings are suggestive of a left sided lesion in the region of the pons. However, in view of the clinical picture (right sided posterior fossa lesion) and only this one examination, we have not sufficient evidence to more than state our findings and what they suggest."

Operation: By Dr. Naffziger. Very extensive left side cerebellopontine adenopapilloma of choroid plexus. Involvement over posterior surface of petrous bone and under surface of tentorium. Partial tumor removal.

Case XVII.—Helen G. Hospital File No. 7649. First seen June, 1920. Patient was in good health until December, 1919. At this time right ankle became swollen and painful. Forced to remain in bed for over a month. No doctor in attendance. In about a month, swelling broke down, discharging a thick, yellowish material. About three months later (March, 1920) patient began to have severe headaches. These headaches occurred daily but were not particularly localized. Lately has noticed that at times vision becomes blurred and troubled with transient diplopia. In May, 1920, first noticed attacks of vertigo. These attacks came on suddenly, and patient attributes them to the result of taking aspirin for headaches. The attacks are transient and there have been none for some time. They were intensified by a quick movement of the body. At times nausea and vomiting were present. Gradually noticed the development of staggering, but could not tell whether it was more to one side than the other. Has never fallen. No trouble with hearing. Tinnitus began in left ear about March, 1920, but is gradually becoming less.

Physical examination: Briefly—Ankle (right), Koch's abscess. Breast (right), Koch's abscess.

Guinea pigs were injected with the discharge from both the ankle and breast and developed tuberculosis.

Neurologic examination: Cranial nerves: I—Normal.

II—Bilateral choked disc.

III, IV, V, VI, VII—Normal.

VIII—See report.

IX, XII—Normal.

Motor and sensory examination negative.

X-ray of skull gave evidence of intracranial pressure.

Neurologic diagnosis: Intracranial pressure, cause unknown; suggestive of posterior fossa, but not localized.

VESTIBULAR EXAMINATION.

Hearing: Normal each ear.

Spontaneous

Phenomena: Nystagmus none.

Past pointing none.

Falling none.

Rotation: To right: Nystagmus, horizontal to left, good amplitude, 17 seconds' duration.

Past pointing, normal both arms.

Vertigo, normal right to left.

To left: Nystagmus, horizontal to right, good amplitude, 16 seconds' duration.

Past pointing, right arm—none (repeated examination). Left arm—correct direction but shortened amplitude and duration.

Vertigo, normal left to right.

Caloric: Head forward 30 degrees. Water 68 degrees.

Right Ear: Nystagmus, rotatory to left, fair amplitude in 50 seconds.

Past pointing, normal each arm.

Vertigo, normal right to left.

Head back, nystagmus horizontal to left, good amplitude.

Past pointing, normal.

Left Ear: Nystagmus, rotatory to right, good amplitude, in 60 seconds.

Past pointing, none either arm.

Vertigo, none.

Head back, nystagmus horizontal to right, good amplitude.

Past pointing, exaggerated each arm.

(Second Examination)

Rotation: To left: Past pointing, none for either arm.
 (Repeated) To left: Past pointing, none for either arm.
 Caloric: Left Ear: Nystagmus, rotatory to right, good amplitude, in 55 seconds.
 Past pointing, none for either arm.
 Vertigo, none.
 Head back, nystagmus horizontal to right, good amplitude.
 Past pointing, normal each arm.

(Third Examination)

Spontaneous

Phenomena: Nystagmus none.
 Past pointing none.
 Falling none.

Rotation: To right: Nystagmus, horizontal to left, good amplitude, 17 seconds' duration.
 Past pointing, exaggerated.
 To left: Nystagmus, horizontal to right, good amplitude, 16 seconds' duration.
 Past pointing, right arm—none.
 Left arm—correct direction, shortened amplitude and duration.

Caloric: Head forward 30 degrees. Water 68 degrees.
 Right Ear: Nystagmus, rotatory to left, fair amplitude, in 50 seconds.
 Past pointing, normal.
 Vertigo, normal right to left.
 Head back, nystagmus horizontal to left, good amplitude.
 Past pointing, normal.
 Left Ear: Nystagmus, rotatory to right, faint amplitude, in 60 seconds.
 Past pointing, none for either arm.
 Vertigo, none.
 Head back, nystagmus horizontal to right, good amplitude.
 Past pointing, normal.

My report said:

"Conclusions: 1. Normal cochlea both sides.

2. Slightly impaired nystagmus tracts of both horizontals.

3. Absent vertigo and past pointing from left verticals.

Diagnosis: Left sided lesion in region of middle peduncle."

Operation: By Dr. Naffziger: Exploratory cerebellar tumor.

Operation report: ". . . Exploration of cerebellum above, below and to the right of the right hemisphere was negative. Exploration above and below the left hemisphere was also negative, but at the lateral portion it was felt that the cerebellum was of increased density. Further exploration revealed a tumor of the inferior anterior portion of the left cerebellum, extending deeply into the cerebellum and reaching nearly to the midline. This growth was attached to the dura."

Tumor removed.

Pathologic report (Dr. Rusk): "Tuberculous granuloma of the cerebellum. The patient developed a generalized tuberculosis of the lungs and meninges and died."

It is essential that these examinations be made by an otologist trained in this work. It is just as essential that the otologist should know enough neurology to consult and seek the aid of the neurologist in the interpretation of puzzling or complicated cases. It will be a happy combination when the otologist seeks the aid of the neurologist in his internal ear cases and the neurologist consults with the otologist regarding the localization of his intracranial cases. In these borderline cases both are able to give valuable diagnostic facts, all of which will be of great benefit to the patient.

Intracranial lesions are notoriously difficult of localization on account of the various responses due to pressure. When we come to appreciate more and more the real significance of the results obtained in the examination of our patients we will realize the new sphere of usefulness of otology. Even now it is encouraging to those interested in this work to note that out of the chaos of only a few years ago, neurotology has already developed a certain amount of order. Perhaps at the present time, the knowledge of this work still in its infancy, we should be content to go no further in our localization than to state whether the lesion is supra- or infratentorial, on the

right or left side. In many cases, even this information is of great value. On the other hand, often the findings are such as to justify a more accurate localization. While it is practically universally recognized that these tests are valuable in the study of suspected brain lesions, there is no question that with an increase of our knowledge of the various pathways and the experience gained by carefully reported cases, followed either to the operating or autopsy table, eventually we will be able to make more definite localizations.

This work, to be of value, must be done carefully by those competent to do it, and the method of examination and of recording our findings must be standardized. If one examiner rotates the patient ten times in twenty seconds and douches the ear with water exactly at 68 degrees, and another rotates ten times in 18 or 25 seconds and douches the ear with water at 65 or 75 degrees, the results are not going to agree; the value of the examination will be nil, and these tests will not receive the place they deserve in diagnostic methods.

A certain technic has been worked out on hundreds of cases by men competent to do this work, and they have established a standard method which, from their experience, gave the best results, and it is this method that should be followed absolutely.

In the interpretation of our findings, we must always bear in mind what Eagleton has brought out—that "interference with the reactions results not only from direct involvement of the structure concerned but also indirectly through pressure." We must realize that "a general increase of pressure or a local pressure on the pons by a neighboring tumor can abolish or impair the reactions from one or more canals, and that such interference with responses does not have a specific localizing value." Those who are doing this work must appreciate these facts. They must differentiate between direct and indirect pressure symptoms, and no better example can be cited than the cerebellopontine angle lesion.

The present problem is to place these examinations in the proper place as regards intracranial localization. While there are many cases in which the neurologist finds no difficulty in making a diagnosis, even without the aid of the evidence gained from the eye, ear or laboratory examinations, still it is useful to have this additional evidence from these other exam-

inations to corroborate his neurologic findings. On the other hand, there are a certain number of obscure cases in which the vestibular tests give the only evidence for localizing an intracranial lesion. Still, as someone has said, it would be "a colossal error for anyone doing such tests to be independent of all other factors in the case."

As long as there exists the false idea that these vestibular tests alone can diagnose or locate an intracranial lesion, just so long is neurootology going to be denied its proper place. There are no short cuts in intracranial localization, and neurologic diagnosis must always hold first place. We must consider all the evidence presented—the vestibular tests simply give additional data to that gained by other examinations—and we must consult with the neurologist regarding our findings. He is the one to decide the final location, and if our findings conflict with the neurologic picture we must be cautious and conservative regarding our diagnosis.

Often our findings are of a definite localizing value, and certain syndromes have become rather clean cut. On the other hand, if our findings only enable us to give suggestive information or confirmatory evidence, either positive or negative, we have done much from a diagnostic standpoint.

As in other branches of medicine, we do not always interpret our findings correctly, but with more cases carefully examined, studied and checked by operation or autopsy, our knowledge will increase. While at present probably the cerebello-pontine angle syndrome is the most accurate of those already developed, I feel it safe to state that, with our added knowledge from these tests, other syndromes will be developed which will prove just as valuable. To accomplish this means, first of all, an accurate knowledge of the normal, then careful examinations, exact observations and recording of results, impartial criticism of one's method and interpretations and, last but not least, not too great a discouragement with our failures nor too great a joy with our successes.

ABSTRACTED PROCEEDINGS OF THE FORTY-SIXTH ANNUAL CONGRESS OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION.

HELD AT SWAMPSCOTT, MASS., JUNE 2, 1924.

THE PRESIDENT, DR. J. PAYSON CLARK, IN THE CHAIR.

SCIENTIFIC SESSION.

Recognition of Nasal Sinus Disease in Children.

BY ROY A. BARLOW, M. D.,

MADISON, WIS.

Nasal sinus disease in children has been overlooked, because of the fact that the existence of sinuses in children has not been stressed in the routine instruction in our medical schools. Recent observations by Dean and others are awakening keen interest along this line. The anatomy is more or less constant, antrums and ethmoids being demonstrated even at the age of six months.

Many unexplained fevers in children are probably due to unrecognized sinusitis. The symptoms include nasal discharge, laryngitis and bronchitis. Very little disturbance is referable directly to the sinuses themselves, and this may account for the fact that the condition is so frequently overlooked.

The X-ray is a valuable adjunct in the diagnosis, as is shown by the series of slides. These demonstrate how well developed the sinuses may be, even in very young children.

Medical treatment is of little value. Antrum puncture produces quite satisfactory results. Unrecognized sinusitis may be the forerunner of other and extensive disturbances which are manifested later in life as hay fever, nasal polyps, and so forth.

DR. L. W. DEAN, Iowa City, felt that good results would follow by putting the patient under proper meteorologic conditions, chief of which was sunlight; with proper diet, espe-

cially one rich in fats, with the removal of causative factors in the upper respiratory tract, chief of which was lymphoid tissue in the naso- and oro-pharynx, with simple nasal treatment and perhaps antrum puncture an apparent cure of almost all cases of paranasal sinus suppuration in infants and young children could be secured.

DR. GEORGE E. SHAMBAUGH, Chicago, asked Dr. Barlow to what extent local manipulations of a surgical nature he considered advisable to carry out in these children. The second point was in regard to the possibility of injuring the lacrimal duct. In the literature there were nine fatal cases following the introduction of a needle into the antrum and injecting air for diagnostic purposes.

DR. JOSEPH H. BRYAN, Washington, said there was risk in injecting fluid or air into an antrum under an anesthetic and also the risk of conveying the infection into the lungs and producing pneumonia.

DR. CORNELIUS G. COAKLEY, New York, thought the paper and discussion were most timely, for while treating sinus disease in adults there has not been the attention given to sinus diseases in children that the matter deserves. Concerning the writer's description of discharge of pus from the nose, in children and adults there is not a real pus but a mucopurulent discharge, much more frequently than pus. This discharge is thick and tenacious. Looking for pus alone we will overlook many cases that have this mucopurulent discharge. The persistent cough often is an accompaniment of sinus diseases. The cough disappears with sinus disease. The sphenoid sinuses develop very early in life. At two or three years of age there is oftentimes a very large sphenoid sinus cavity in the sphenoid bone. There is nothing in X-ray or any other method of value except that of the pharyngoscope, which must be used for diagnosis.

DR. PERRY G. GOLDSMITH, Toronto, addressed his remarks particularly to the interpretation of the washing of the nasal mucosa of children. Edema of the nasal mucosa of children is an essential factor in sinus disease. He had one fatality in a punctured antrum; the patient dropped dead in the chair. It is as easy to wash the sphenoid out as the antrum—some-

times easier. If one enters by way of the sphenoidal ostium it is difficult.

DR. EMIL MAYER, New York, made an addition to the therapy Dr. Barlow brought out; that is, the instillation of a weak saline solution of adrenalin before the inhalations are made. He is not very much of a believer in how much you can do for a child under local anesthesia on account of the psychic effect, because of approaching the child with instruments. He thought a 5 per cent solution of cocain was a strong solution to use on a child. One could get all the results desired from a 1 or 2 per cent solution of cocain.

DR. CLEMENT F. THEISEN, Albany, said he wished there was some way in which the rising generation could be impressed with the facts brought out today.

DR. HENRY L. SWAIN, New Haven, knew of one case of death from air embolism.

DR. C. SEWALL, San Francisco, reported a case of death from air embolism in his clinic, and postmortem showed considerable air in the heart.

DR. ROY A. BARLOW said concerning inflation that the punch has a larger harpoon point than the diameter of the canula. There is plenty of room for escape of air around and pressure is by Politzer bag. He used suction apparatus and saw no reason why the patient should develop pneumonia. Local anesthetic did not give him satisfactory results.

Deep Radiotherapy.

BY WILLIAM DUANE, PH. D.,
BOSTON.

There are two important methods in the treatment of malignant diseases, one by surgical removal and the other by retarding the growth of the malignancy by X-radiation.

A special apparatus for the determination of the proper dosage, in the form of a water phantom, was explained. In this way the intensity of the X-radiation in the patient may be ascertained. The broad beam of X-radiation is more penetrating than the narrow. The matter of exact dosage was considered the most important phase of this therapeutic measure.

Report of Cases of Carcinoma of the Esophagus Treated by Combined Use of Radium Emanations and Deep X-Ray.

BY D. CROSBY GREENE, M. D.,
BOSTON.

Sixteen cases are reported in which the combined method of radiation was employed. In every case the diagnosis was established by esophagoscopy and removal of specimen for biopsy. Radium emanation seeds were inserted into the growth under direct vision with the aid of the esophagoscope, by means of specially constructed long trocars. After the insertion of the seeds the patients were treated by a series of exposures to the high voltage X-ray. After varying intervals, usually six to eight weeks, the treatment was repeated, in some cases only the X-ray treatment, in others both the seed insertions and X-ray being employed.

Patients reported in most instances an improvement in swallowing and a slight gain in weight. This improvement in the most favorable cases lasted from three to six months, in others only a few weeks. One case lived for a year and a half and died of other causes, with disease in the esophagus still present. The end results were all fatal, excepting recent cases, still under treatment. No autopsies were obtained in this series. The cause of death in two cases was reported as hemorrhage, in one case into the lung, and in one into the bowel. In most of the fatal cases the patients were able to swallow liquids up to the end, but showed an increasing disinclination to take nourishment and grew gradually weaker until they died. Death was not due to inability to take nourishment, but seemed possibly due in part to toxemia from the absorption of products of decomposition of food and detritus which accumulated above the stricture. If nourishment is adequately maintained through a gastrostomy and the esophagus kept clear of all food, these patients maintain their weight and strength better, and a better opportunity is offered for radiotherapy.

Carcinoma and Sarcoma of the Esophagus.

BY CHEVALIER JACKSON, M. D.,
PHILADELPHIA.

It was stated by the author many years ago that the mortality of malignant disease of the esophagus was, at that time,

100 per cent. Notwithstanding the great advances made in the surgery of malignancy elsewhere in the body, the ultimate prognosis of esophageal cancer remains the same today.

There is every reason to believe, however, that the reason for this is that the surgeons have never had the chance to develop the technic of a curative operation, because the diagnosis is never made early.

Diagnosis is never made early, because the textbooks and journal articles give chiefly or exclusively diagnostic methods that are always negative early in the disease.

When the time comes in which esophagoscopy shall be resorted to promptly on the appearance of certain very vague symptoms, there is ample justification for the belief that the surgeon will cure a good percentage of patients.

Squamous celled endoesophageal carcinoma is not an aggressive type of malignancy. On the contrary, it is a mild, slow and, for a long time, purely local process.

Under palliative treatment, if the patient is never permitted to be short of an abundance of water and a full allowance of properly balanced food elements, most cases will survive at least two years from the onset of the disease, and some have survived as long as five years. One lived six years.

Patients running the gauntlet of late inferential diagnosis, and leading a precarious existence of various degrees of food and water starvation, depressed and acidotic, on a diet of intermittent supplies of raw eggs and meat broths, may not survive more than a year from the probable time of the onset of the disease.

The bougie as a diagnostic means is not only dangerous, but it is inconclusive because inferential; and it is always hopelessly late. A cancer must be well advanced before it will stop a bougie.

The bougie as a therapeutic measure hastens death, either by perforation or by increasing metastases. As stated by DaCosta and Shallow, "No surgeon would stretch a cancer."

There are only two means by which an early diagnosis of esophageal malignancy can be made, namely, (1) Roentgen ray examination, and (2) esophagoscopy. All other means are late, inconclusive, and some of them dangerous.

By esophagoscopy, endoesophageal cancer can be diagnosed early, and with the absolute certainty essential to getting the consent of a comparatively well man to an operation he may not survive.

Endoesophageal cancer can be diagnosed just as early, just as quickly and just as certainly as cancer of the cervix if an opportunity for esophagoscopy is afforded early.

DISCUSSION.

DR. HARRIS P. MOSHER, Boston, referring to Dr. Jackson's paper, said that the smaller the specimen is the more the danger increases. If there is slight thickening of mucous membrane and a piece of tissue is removed, there is danger of getting outside the esophageal wall.

DR. SWAIN, referring to Dr. Greene's paper, reported a case of visible ulcer of the esophagus just below the introitus that was cured by simple application of 15 per cent nitrate of silver on the lateral posterior wall.

DR. CHARLES J. IMPERATORI showed a cage, or carrier, somewhat like an intubation tube, for the application of radium in the esophagus.

Apparently the action of the radium stays the progress of the disease. No cures could be reported.

DR. THOMAS E. CARMODY, Denver, stated that he reported before the Bronchoscopic Society last year two cases cured with radium. They had been quiescent for only a few months. One case died of pneumonia on Christmas day, 1922; the other is alive and working on a farm. In neither of these cases was biopsy performed, so one may say it was not proven. However, it is felt that removal of a section in either case would have killed the patient or at least lessened his chances.

DR. BURT R. SHURLY, Detroit, said that he had three cases of carcinoma of the esophagus that are greatly improved and still alive at the present time, following combined treatment of radium and deep X-ray therapy.

DR. CHEVALIER JACKSON said he understood Dr. Mosher questioned the occurrence of nonmalignant ulcers of the esophagus. He agreed that they are very rare and that such a diagnosis was always open to question, but he had seen a few such cases at the clinic. In most instances they were

peptic ulcers at the lower end of the esophagus. They were associated with more pain than was present in cancer, and, the pain being due to flooding with gastric juice, was relievable by alkalies, whereas, cancer pain, if present at all, was not.

Colloid Goiter of the Tongue.

DR. PERRY G. GOLDSMITH presented a specimen of a tumor. It was a solid tumor, somewhat nodular in form, of epithelium and enlarged vessels. It was found in a woman thirty-four years of age, who complained of persistent difficulty in swallowing for many years. She had some tubercular signs. X-rays were negative. Tumor was situated in base of tongue, off the center line above the epiglottis. It was punctured and not cystic. It proved to be a colloid goiter.

DR. D. CROSBY GREENE presented a patient, treated with radium for carcinoma of the esophagus.

DR. SWAIN presented a wax model of a laryngectomy case.

Suture of the Tonsil.

DR. BURT R. SHURLY showed an instrument for passing a suture in case of tonsil hemorrhage, that carried with it a needle and gave opportunity for very quickly passing a suture. The handle is stable and does not allow turning that sometimes take place with a needle. There is a right and left.

DR. CHEVALIER JACKSON showed stereoscopes of the larynx.

Lye Strictures of the Esophagus.

BY RICHARD MCKINNEY, M. D.,

MEMPHIS.

In this paper the writer gives a summary of his observations in the treatment of eighteen cases of lye stricture of the esophagus, occurring over a period of two years. The frequency of this distressing condition makes it imperative that innocent children should receive the protection of state legislation in an attempt to reduce the number of these cases. Attention is called to the fact that many of these cases of lye stricture do not develop until several weeks after the primary burn of the mouth is received, and thus there is carelessness in the matter of securing adequate treatment before the scar tissue in the esophagus has contracted to an extent where treatment is difficult, and where sometimes a gastrostomy be-

comes necessary. In the eighteen cases reported seventeen were treated successfully, with practically complete relief from the stenosis, but McKinney is inclined to believe that once a patient with lye stricture of the esophagus, always a patient, as his experience had been that such cases must be dilated from time to time in the future. Most of the cases of this condition occur in young children. If a conspicuous label be placed upon the lye containers it is thought that parents, oftentimes ignorant, will be sufficiently advised to keep this destructive escharotic out of the reach of crawling babies and young children who may swallow it.

DISCUSSION.

DR. CHEVALIER JACKSON said in a number of cases of total atresia of the esophagus of the impermeable form above, Dr. Clerf and Dr. Tucker penetrated from below by retrograde esophagoscopy with the esophagoscopic filiform carrying a string. When this fails there remains only penetration with a steel instrument from the retrograde to the peroral esophagoscope under the double plane fluoroscope. This is a dangerous procedure and especially when the distance to be penetrated is more than a centimeter.

DR. EMIL MAYER asked whether there is not much danger in dilating the esophagus when eroded with lye.

DR. CHEVALIER JACKSON said if the entire periphery of the wall of the stricture was cicatricial tissue there probably would be very little danger, but practically all lye strictures have a segment of normal wall, and that normal wall was where we get our permanent results, if dilated slowly enough. The permanency of dilated normal wall was shown in so-called cardiospasm.

DR. THOMAS HUBBARD said the end results depend upon the depth of ulceration and character of stricture. Many of these cases go back to practically normal condition. With the string guide one can feel perfectly safe and avert gastrostomy. Even though active dilatation is not contemplated, the stomach tube may be passed and nutrition kept up during that period of active inflammatory reaction.

DR. CHARLES J. IMPERATORI recalled two cases of lye stricture that were dilated, in one instance 45 years and in the

other 35 years after swallowing of the lye and after the original dilatation. The electrically heated bougies seemed to give quicker results in these lye strictures.

DR. DEAN said Dr. Lynch and others use the electrically heated bougies. This bougie makes edematous and softens fibrous strictures so that after they had been used a larger sized dilating bougie may be passed than before their use. It hastens very much the dilatation of fibrous strictures in the esophagus.

Syndrome of Avellis With Report of Three Cases.

BY CHARLES J. IMPERATORI, M. D.,

NEW YORK.

The diagnosis of this syndrome is based essentially on the following clinical manifestations:

(a) Paralysis of the soft palate, partial paralysis of the constrictors of the pharynx, paralysis of the vocal cord and partial paralysis of the esophagus. These paralyzes are ipsilateral to the lesion.

(b) Contralateral loss of pain and temperature sensibility of half of the body below the interauricular line.

(c) The retention of all other somatic types of somatic sensations in the areas showing defects in pain and temperature sensibility.

(d) Chronic endarteritis.

(e) The absence of all other symptoms—that is, motor and sensory disturbances.

Three cases are detailed descriptive of this lesion.

DISCUSSION.

DR. GOLDSMITH said a patient was brought into the General Hospital not long since, unconscious, with diabetes; insulin was given and a very happy result very shortly followed. The patient was quite bright and clear, but had a rough voice, with some little difficulty in swallowing. There was some paralysis in right half of soft palate, lack of sensation, difficulty in swallowing. There was double abductor paralysis. The patient had a voice and it was very good. Was the poison of the diabetes the cause of the bulbar condition? The patient died rapidly of a progressive bulbar lesion.

DR. HARRIS P. MOSHER asked if there is unilateral involvement of the soft palate, of the muscles of the pharynx and larynx, why does the cricopharyngeus remain in spasm?

DR. IMPERATORI said, regarding Dr. Goldsmith's question, that if his patient had a double paralysis, then he is not dealing with this condition under discussion. This condition is unilateral, the paralysis being on the same side as the lesion, with the pain and temperature changes on the opposite side.

Referring to Dr. Mosher's question, the cricopharyngeus is not in complete spasm. It almost appears that way on endoscopic examination, but on closer investigation the lateral fibers are seen to be paralyzed, while the healthy side is in a tonic spasm, thus giving rise to the symptoms detailed.

The Medical and Surgical Treatment of Laryngeal Tuberculosis, Including a Preliminary Report on the Direct Injection of Tuberculin Into the Larynx. (Illustrated by Colored Lantern Slides).

BY FRANK R. SPENCER, M. D.,

BOULDER, COLO.

The paper mentions the importance of tuberculosis and the responsibility of suggesting new methods of treatment. The early history of laryngeal tuberculosis in the literature is mentioned. The importance of tuberculosis in the West and its early diagnosis and treatment are emphasized. The following methods of conservative treatment are mentioned:

Vocal rest, dilute aqueous solutions of lactic acid, from 5 to 30 per cent, applied on a cotton wound applicator, formalin in 2 to 5 per cent solution, applied on a cotton wound applicator, chaulmoogra oil to be dropped into the larynx with a laryngeal syringe, climatic treatment, sunlight treatment with the solar laryngoscope, treatment with the quartz lamp, Finsen light, radium and X-rays.

The following surgical methods are mentioned: The galvanocautery, curettage, excision of tuberculomata, especially by suspension, injection of alcohol for the relief of pain in the later stages, tracheotomy, laryngectomy, amputation of the epiglottis for epiglottidean tuberculosis, gastrostomy for the relief of dysphagia and direct injection of tuberculin

into the larynx. He called attention to the importance of using small doses of tuberculin, beginning with 1/10 of 1 milligram of O. T., the solution not to exceed 1/2 to 1 cc. in volume, with injections at intervals of two to six weeks. Small injections are advocated to avoid edema at the site of injection.

Small localized areas in which the focal and local reaction can be combined are best suited to this method of treatment. Large areas can be treated much better with the cautery. Advanced cases of laryngeal tuberculosis and patients with fever above 100 degrees are not suitable for this treatment.

DISCUSSION.

DR. GOLDSMITH said so far as treatment was concerned the injection of tuberculin was useful. He thought it was not likely to act in the way described. The action of the cautery seemed to be the best method of treating tuberculosis.

DR. EMIL MAYER said he was glad to note that the speaker called attention, however briefly, to something that had become almost a fad of his—that was the question of lupus. He believed that in Colorado, lupus was not seen nearly as much as in the larger clinics, for the reason that patients sent to Colorado are those with undoubted and often advanced tuberculosis. Lupus, on the other hand, may exist without any symptoms whatever—that is, it comes as a surprise, and one finds an enormous amount of destruction. Few tubercle bacilli are present.

DR. T. E. CARMODY said it was found upon examination of over 1,400 cases in General Hospital No. 21, Army Hospital for Tuberculosis, in Denver, that 95 per cent of all cases with pulmonary tuberculosis showed hyperemia of the larynx.

DR. BURT L. SHURLY stated in his city there is a tuberculosis sanitarium in which for many years one out of every ten of the cases has involvement of the larynx. It sometimes runs as high as 15 per cent. This very wonderful contribution was very interesting to him from many different viewpoints. The one treatment which was not mentioned and which has been of the greatest value was the sunlight treatment of the larynx.

DR. WILLIAM MULLIN said that about eight years ago, in conjunction with an internist, he took a series of cases of pulmonary tuberculosis complicated with laryngeal tubercu-

losis, and, with the consent of the patients, gave them tuberculin. Three injections of salt solution were first given and then changing to tuberculin. Observing the larynx closely for its effects, in most of the cases an unfavorable reaction in the larynx was seen when the tuberculin dose was increased. He felt that it was not a good therapeutic agent for laryngeal tuberculosis.

DR. H. L. SWAIN said he had four cases on record where the general tuberculosis had gotten better in Saranac, but the local tuberculosis in the larynx was not improved. In these a systematic series of gradually immunizing injections was given, beginning with tuberculin old. Improvement was noted that could not have been obtained in any other way. In one case there had been no improvement to speak of for a year and a half until the tuberculin was given, and this resulted in a complete cure lasting now for 15 years.

Extensive Osteomyelitis of the Cranial Bones Secondary to Paranasal Sinus Disease. Report of Two Cases.

By H. I. LITTLE, M. D.,

ROCHESTER, MINN.

In 1923, Lamere reported a case and collected 59 others from the literature. It is very apparent that the disease was looked upon as a very serious complication of paranasal sinus disease, and radical surgical interference was looked upon as the most satisfactory manner of management. McKenzie had thought that the disease would seldom develop from a maxillary sinus infection.

The two cases reported in this paper apparently began, following surgical interference upon a maxillary sinus. The first was a woman, aged 30, with a three months' history. The trouble began two weeks following an alveolar operation upon a maxillary sinus. It quickly spread to the ethmoid, lacrimal and frontal bone. The patient was very ill. All laboratory tests, including bacteriologic and serologic, were negative. Radiologic pictures showed a condition quite similar to a luetic involvement; the provocative tests for lues were negative. A very radical external operation was performed, and it seemed to control that part of the disease. However, the patient died of a suppurative cortical brain disease secondary

to an independent focus in the parietal bone. A necropsy was performed. The pathologic slide and photographs of the frontal bone and the diseased brain are shown.

The second case was a man, 33 years old, with a history of sinus disease of five years' standing. There had been several attacks of acute otitis media. The first nose operation was performed when the patient was in military service, since which time many operations had been done, including a radical external frontal. When the patient presented himself, he had many open and draining sinuses throughout the scalp, and he looked very ill. In the general physical examination the X-ray pictures revealed a lesion in the right upper pole of the lung, thought at first to be tuberculosis. However, careful sputum examinations were negative, and subsequently the guinea pig inoculations were entirely negative. The radiologic pictures of the skull showed a very extensive lesion, strongly suggestive of lues. In this case the provocative test was negative. The patient died, apparently of an intracranial extension, but no necropsy was performed.

The interesting feature about these cases was that there was apparently no positive etiologic factor for the disease, at least no specific etiologic factor. Both cases were in extremis or nearly so. The author believes that there must be a stage in the management of this type of disease when a more successful outcome could be expected. The incidence of this disease as a complication is fortunately very low.

DISCUSSION.

DR. J. H. BRYAN, Washington, requested information on the following case. The patient had a chronic pansinusitis and had been extensively operated upon. A year ago she went to Paris and was desperately ill last July with very marked cerebral symptoms and mental aberration. Fortunately, nature stepped in and emptied an enormous abscess. When seen last September she was a walking skeleton and with an enormous amount of foul smelling pus pouring out from the nose and through the antrum, through a fistulous opening. The disease had extended down into the spongy portion of the sphenoid. All manner of treatment has been used, but the disease continues its progress.

Treatment of Papilloma of the Larynx by Fulguration and Diathermy.

BY THOMAS HUBBARD, M. D., AND ENAN G. GALBRAITH, M. D.

The authors call attention to the excellent work of urologists in eradication of papillomata of the bladder as an object lesson to laryngologists. The comparative pathology of papilloma of the larynx, bladder and verruca vulgaris, and surgical indications bearing on laryngeal work, is reviewed. Potential malignancy and danger of converting a benign or borderline neoplasm into malignant activity by surgical trauma is emphasized by the teachings of pathologists. Transplantation of papilloma of the larynx by abrasion of mucosa and inoculation of the juices of the neoplasm; contact reproduction accounting for multiple papillomata—all of these characteristics indicate the line of rational surgery. This was summarized in the conclusion that the destruction of these tumors must be by a bloodless method. Fulguration and diathermy, aided by the suspension method, meet these requirements. The dangers of ether anesthesia and the fulguration spark are discussed and precautions outlined. A summary of six cases treated was presented.

The Direct Removal of Laryngeal Papillomata: A Simple Technic.

BY RICHMOND MCKINNEY, M. D.

The experience of the writer of this paper in the treatment of laryngeal papilloma in children by the method of direct removal through the Jackson speculum, with various kinds of forceps, is given. The technic involved is so simple that the patient can leave the hospital within an hour or two after operation, no anesthetic being used. In a previous paper, published some two years ago, a number of successful cases were reported, and this paper offers additional cases in which removal had ultimately been successful. McKinney does not in any way underrate the value of fulguration or radium in the cure of these cases, but since he has been successful with this method, does not at present see the necessity in his own practice of using any other. Tracheotomy he finds of no especial value in the treatment of this condition, although it must of necessity be used at times, owing to the laryngeal obstruction.

DISCUSSION.

DR. GILBERT SMITH, Boston, was interested to see that some of his problems are the same as ours, although in general he thought the tendency of growths in the larynx was more toward true warty than the growth found in the urinary tract. In the urinary tract all papillomata are regarded as potentially malignant, Dr. Hubbard quoted from Geraghty, and serial sections will almost always show. These tumors will recur as definite carcinomatous growths.

DR. GORDON B. NEW said that he had little experience with this method of fulguration that Dr. Hubbard had used, except in adults with papillomas of the larynx. He used the bipolar method in these cases. In the treatment of children with multiple papillomas of the larynx he had used radium almost exclusively. A tracheotomy was not done unless there was obstruction. The patient was suspended, using Dr. Lynch's suspension apparatus, and the emanation tube placed against the papilloma under direct observation. No ill effects had been seen from the use of radium by this method and the results have been very satisfactory. Of course, this method was not a cure all, but the results have been most satisfactory.

DR. CHARLES J. IMPERATORI said his experience with papilloma during the past two years was confined to twenty cases. He thought that we are going to have these reports continue ad infinitum until we determine the cause of papilloma. The transplantation of papillomata has been successfully done by the dermatologists and by coworkers of Hajek of Vienna. Experience with the use of radium in a considerable number of cases has been in the adult. This use of radium has been not after the method described by Dr. New, but by the use of five or ten milligram needles which were plunged into the base of the papilloma and left there three to five hours. The result in these cases was fairly good. The use of protodid of mercury was suggested by Dr. Trimble, a dermatologist. The results appear to be very good. The protodid was given in usual dosage.

DR. R. C. LYNCH said that there wasn't any doubt about the fact that papillomas are autografting, so that any traumatism to surrounding surfaces or even as occurred in one

of his cases, the dropping of a wart into the external canthus of the eye, reproduced a wart at that point. The crushed up papilloma will regrow in the mucous membrane of animals. He thought tracheotomy was a bad proposition, excepting when absolutely necessary, because the warts will grow at the edge of the tracheotomy tube and there will be tracheal papilloma as well as laryngeal papilloma. One of his cases was a contradiction to everything he had ever heard and has been operated on sixty-two times. It was his experience that papilloma did not grow from a little pedicle, but over a broad base that has many vessels, and unless all the papilloma was destroyed at one sitting there will be a recurrence and fresh growth at some new point.

DR. GEORGE RICHARDS asked: "Is it not true that the trouble is due to some chemical constituent of the wart?"

DR. HUBBARD concluded by saying that the only point he would like to leave in connection with this subject was that we must adopt a bloodless method of treating papilloma of the larynx.

Empyema of Antrum of Highmore of Scarlatinal Origin.

By VIRGINIUS DABNEY, M. D.,

WASHINGTON.

The origin of scarlatina was now conceded to be a streptococcic infection. Irrigation of the nose with saline solution diminishes incidence of ear involvement in scarlatina and contributes to the patient's comfort. This suggests the author's belief that sinus involvement was much more common than recognized, though previous to this report no case of empyema has been seen by him of scarlatinal origin. Case report.

DISCUSSION.

DR. C. F. THEISEN said that he had called attention to this in a paper before the American Laryngological Association several years ago, and at that time quoted the work that had been done prior to that at the Boston City Hospital by Richard Mills Pierce. He reported autopsies of fifty or sixty cases that died of scarlet fever, measles or diphtheria. He found practically in every case in which the patient died of measles, scarlet fever or diphtheria, pus in the antrum or other accessory sinuses.

DR. B. L. SHURLY said in connection with the drainage of sinuses due to infection of scarlatinal origin, it might be well to call attention to a new and very useful potent serum just brought out for scarlatinal infection. It has given some great results in Detroit and elsewhere, and it is certainly well to bear that in mind.

Report of a Case of Congenital Stenosis of the Larynx in a Three-Year Old Child.

BY CLEMENT F. THEISEN, M. D.,

ALBANY.

Child admitted to medical service, Child's Hospital, for difficulty in breathing that had been going on for some time.

The writer was asked to see the child by Dr. Winne, who had medical service at that time. When the child was admitted there was a discharge from both ears and nose. Pharynx reddened and tonsils inflamed and moderately enlarged. Cultures for diphtheria negative. Child's breathing suggested presence of foreign body in larynx or trachea, although there was no history of that kind.

Satisfactory examination of larynx impossible in ordinary way, so small Jackson tube was passed. Mucous membrane of larynx markedly edematous, and as child's breathing became very bad, no attempt made to pass tube farther down.

The edema at this time was considered part of the infection of upper air tract, and an ice coil was used for several days with no result. Another attempt was made a few days later, under ethyl chlorid anesthesia, and then a very tight stricture was discovered. Glottis so narrow that smallest bougie writer had could not be passed through.

Writer recommended tracheotomy and operation for stricture while tracheotomy tube was in place.

Dr. Holding, who had recently settled in Albany, and who had taken a course with Jackson, wanted to make an examination, and the attending physician was anxious to have another attempt made to pass a Jackson tube. The child died very suddenly while Dr. Holding was trying to pass a small Jackson tube. Autopsy showed an extremely tight stricture of the larynx, undoubtedly congenital.

The lungs were carefully explored, with no evidence of a foreign body anywhere in the passage. A pleurisy with small amount of fluid was found on right side, otherwise lungs were normal.

Dr. Holding was very skillful in his manipulations, and was in no way responsible for the unfortunate termination of this case.

DISCUSSION.

Dr. FARLOW said that he had two cases of congenital webbing with a similar picture. He had the same sort of symptoms, and he thought that some of these cases at first were exceedingly difficult to differentiate. All cases in small children are very difficult to diagnose. The tissues all about are more or less hard, and unless one gets accurate touching, it was difficult to tell whether it was a web.

The Diagnosis Problem in Status Lymphaticus.

By DR. JAMES A. BABBITT, M. D.,

PHILADELPHIA.

This paper accepts the fact of varying consensus as to pathologic entity but considers physiologic and pathologic alteration complex under title an important correlation to recent works of Loeb and Mayer on operative fatality.

Status lymphaticus represents wide variation in lymphatic dyscrasia, historically confused with leukemia, pseudoleukemia, chlorosis, scrofula and Basedow's disease; intimate relation to endocrine function, endotoxic resistance and anaphylactic reaction. Importance to laryngologist is in safeguarding his numerically major field of surgery—lymphoid areas of upper respiratory tract.

Four important questions:

1. What is real etiology and function of thymic and adenoid tissue?
2. Is the pathology, cause or effect of hyperplastic change?
3. What is the effect of surgical extirpation on marginal lymphoid tissue?
4. Does bacterial infection produce its own blockade immunity?

Wood's work on Tonsillar Pathology, Pemberton on Complex Syndrome of Focal Infection, Fetterolf and Fox's Re-

searches on Postoperative Infection, Bloomfield and Felty's Studies in Tonsillar Bacteriology have aided in solving this problem.

The diagnosis problem of status lymphaticus covers the question of preliminary suspicion, diagnostic confirmation, gravity in operative decision, postmortem pathologic justification for sudden death.

Chief suspicion, based on family history, of cases of sudden death, infantile eclampsia, anaphylactic reaction, poor resistance to disease, confirmed by conditions of the skin, fatty changes, rachitis evidence, genital hypoplasia, X-ray thymic diagnosis, general lymphoid and exudative catarrhal diathesis.

The writer discusses reports of 40,000 necropsies at Bellevue Hospital, with minute reports on lymphoid hyperplasia; a study of 1,900 surgical adult autopsies without special reference to this phase, and presents a limited review of status lymphaticus symptomatology in cases of fatalities at Children's Hospital, Philadelphia.

The writer discusses anaphylactic possibilities in status lymphaticus syndrome, with apparently recessive type of status lymphaticus, similar peritonsillar infection and concealed thyroid distribution. Result of autopsy is given, which shows hyperplasia of lymphoid organs, pressure from thymus and hypoplasia of great vessels with marked congestion of left lobe of thyroid.

Paper concludes with general deduction from the above and consideration of the syndrome presented in status lymphaticus.

DISCUSSION.

DR. MOSHER said, referring to the facts in this case, what struck him was the enlarged tissue at the base of the tongue. There were pimple-like areas running from side of tonsil to pharynx. All cases were X-rayed as a routine before tonsillectomy. It was found that of these, 71 cases had an enlargement of the thymus and that all of them had been given the routine therapeutic X-ray treatment for thymus, and in all of them the thymus had come down.

In all of the suspicious cases there had been a blood count as soon as the case was found, and a blood count as soon as the case had X-ray treatment. There was no change in the

blood count after the X-ray treatment, although the thymus shadow had disappeared and the case had been pronounced normal as far as we could see. Now, about the blood count: The lymphocyte count, which was the important one, was around 25 to 30.

DR. MAYER said that he had been very much interested in this subject, particularly in view of the knowledge that the investigations are being made of the deaths from local anesthesia which do occur so frequently. The diagnosis of status lymphaticus was so often made that he determined, as far as he could, to obtain what evidence there was. That there was such an entity as status lymphaticus we have long acknowledged, but that it has been a cloak to hide behind in cases of sudden death has been fully proven.

DR. DEAN said, in every child before operation, the size of the thymus was determined, first by percussion and second by auscultation. In auscultation, the stethoscope was placed over the center of the thymus, and the observer began by scratching the skin near the axilla with a card. As soon as the card scratches inside the margin of the thymus theoretically the sound was heard louder.

The Modern Treatment of Nasopharyngeal Fibromas.

BY GORDON B. NEW, M. D.

During the last fourteen years, 1910 to 1923, inclusive, we have examined at the Mayo Clinic thirty-two patients with fibroma of the nasopharynx. This group includes only the hard fibromas. Twenty-nine, or 90.6 per cent, of these patients at the time of examination were between the ages of ten and twenty-five years, and three patients, or 9.3 per cent, between the ages of twenty-seven and thirty-one years.

Twenty-three of the thirty-two patients in our series had been operated on from one to twelve times before their examination in the clinic. The average number of operations was between three and four.

From 1915 to January 1, 1924, twenty-four patients with fibromas of the nasopharynx were examined. Twenty-three were treated with radium.

The radium treatment was applied by three methods. In the first or early cases a T-shape lead applicator with a 50

mg. tube of radium in the trough of the T was held in various positions against the tumor in the nasopharynx. The original dose was usually a 50 mg. tube for from ten to fifteen hours. It was difficult to apply the radium accurately in this manner, and there was severe reaction in the structures around the tumor. In two cases the palate was perforated.

In the second group of cases, steel points containing the radium emanation or the element, were inserted directly into the tumor. Three or four points were usually inserted, depending on the size of the tumor, about the same amount of radium being used as in the initial dose.

In the third group of cases emanation seeds averaging one-half to one millicurie each were implanted directly into the tumor, the number depending on the size of the tumor. This method has been used in recent cases only. Such treatments are repeated in from six weeks to two or three months, depending on the reaction and result of the previous treatment. The dosage of the secondary treatment varies greatly, depending on the progress of the case. The number of applications required in the cases now cleared up varied from two to nine, averaging between five and six. The length our patients were under treatment before the condition cleared entirely varied on account of the distance some lived from the clinic and the difficulty in returning; the average length of time was fourteen and two-tenths months. Several patients had been operated on elsewhere with much bleeding. The radium seemed to control this immediately. The crusting and scabbing secondary to the radium treatments may be cared for symptomatically by the use of oil sprays, and potassium iodid, internally.

Twenty-four patients were examined after the use of radium. Fifteen of nineteen traced have been cured; four patients are still under treatment, having registered in 1923.

Of the fifteen patients cured, two were well from seven to eight years, two from five to six years, one from four to five years, three from three to four years, three from two to three years, and four from one to two years.

DR. R. C. LYNCH exhibited motion pictures of an *Intralaryngeal Operation*.

**Report of a Case of Carcinoma of the Trachea With Secondary
Involvement of the Esophagus, Causing Unilateral
Recurrent Nerve Paralysis.**

BY THOMAS J. HARRIS, M. D., AND HENRY H. FORBES, M. D.,
NEW YORK.

The total number of cases of primary carcinoma of the trachea would seem to be less than sixty.

A bibliography prepared by Dr. L. Glushak was reviewed.

The importance of endoscopic examination in these cases was stressed.

DISCUSSION.

DR. T. H. HALSTEAD recounted a case of a malignant growth of the trachea, part of which was coughed up after a few hours' prayer under the guidance of a divine healer. There was considerable relief for over five months, but the patient died within six months from the time of observation.

DR. H. L. SWAIN said that Dr. Halstead's case reminded him of a case where four different times in the course of three years papillomatous masses were coughed up. The patient died of pneumonia and, just previous to his death, coughed up his last papilloma, which was about the size of a cherry stone.

DR. INGERSOLL said a number of years ago he reported a case of primary malignancy of the trachea, in which the diagnosis was established positively by the microscopic examination of two small tumors, which were detached by a severe paroxysm of coughing and expectorated by the patient. In this case there was an involvement of the esophagus. If Dr. Harris has come to a definite conclusion in regard to his case, he would like to have him state whether the growth was primary in the esophagus or the trachea. Primary carcinoma of the trachea is very rare.

DR. BARNHILL said that he saw cases in which there was an asthmatic tendency and often finds, as in this case, that the disease was not asthma at all. Of course, any obstruction in the neighborhood of the trachea or bronchi will cause asthmatic symptoms. In this particular case he gathered that the approximation of the vocal cords, due to the disturbance of the recurrent nerve, had much to do with this asthmatic state.

At any rate, recurrent nerve paralysis occurred in other affections in which there was no malignancy whatever.

DR. HARRIS said he did not think it was possible to determine beyond question where was the primary seat of the growth. It was assumed from the clinical picture, namely, no difficulty whatever in swallowing and symptoms of beginning dyspnea increasing all the time, that the primary focus was on the right side of the trachea and that it was a secondary involvement in the esophagus.

A Broader Approach to Unsolved Problems in Laryngeal Action.

By ELMER L. KENYON, M. D.

This essay studies the principles bearing on the relationship of the extrinsic musculature to vocal cord action. The author's summary and conclusions are as follows:

1. The intrinsic musculature of the larynx possesses physiologically no power of adductive action independent of the extrinsic musculature.

2. The extrinsic musculature is an important factor in facilitating adductive action of the vocal cords in general, and especially in determining their finer adductive adjustment.

3. Knowledge has already been accumulated that demonstrates the importance of the extrinsic musculature in certain disturbances of the vocal cord action.

4. Solution of certain unsolved problems in disturbed laryngeal action depends largely on the simultaneous study by laryngologists, intrinsically of vocal cord action, and extrinsically of the action of the extrinsic musculature as a routine procedure.

5. The action of the extrinsic musculature has thus far been studied by the author by finger palpation.

6. The value of a generally broader point of view in the study of certain laryngeal problems is illustrated by examples drawn from the literature of laryngology.

DISCUSSION.

DR. HARRIS remarked that this Association bore as its name "The American Laryngological Association." Its earlier papers were valuable contributions to the subject of laryngology in various phases, not merely here, but in all our scientific work in recent years such papers have been distinguished by

their absence, for the most part. We have been dealing with other problems, very important, of the sinuses, nose and what not, but such papers as this representing studies such as Dr. Kenyon's have been conspicuous for their absence.

DR. N. H. PIERCE said it was accepted by all physiologists of the voice that the three positions of the larynx correspond to the three registers of the voice. It was known that if the cricothyroids were wrongly used strained voices resulted, although the intrinsic muscle may, as far as can be seen, appear to be used properly. It is known that vocal nodes will result if the cricothyroids are used improperly. It is known that if the chest register, as it is called, was carried up into the middle register too far, strained cords resulted, with laryngitis. All these things very largely depend upon the extrinsic musculature. For instance, in the chest register the vocal cords are loosened, and they vibrate in their whole length; in the middle register they are more tense and begin to be fretted. One can see that very readily under the laryngoscope, just as a violin's strings fret as we go up the scale. Here is where the combination of the two systems of musculature are most important—that is, the extrinsic and the intrinsic musculature.

DR. C. L. THEISEN said the point he could not understand was this: In a complete paralysis of the left cord, adductor and abductor, the cord is immovable in the median line. He could not understand why you don't get more motion of the vocal cord in a complete paralysis, if the external muscles have so much influence in adduction.

What Constitutes an Ideal Tonsil Operation?

BY SECORD H. LARGE, M. D.

For twenty-five years we have been endeavoring to originate or else assemble from other tonsil operations the best points in order to perfect an ideal tonsil operation. Most of the important clinics in Europe and the United States have been visited. The technic which we employ is a composite of the various types seen in these clinics, along with some original features.

1. Preoperative Care.—The patients are instructed to take $\frac{1}{2}$ teaspoonful bicarbonate of soda in water three times a day

for three or four days before the operation. They seem to recover more quickly, and in some cases where a general anesthetic was given, there was less nausea following it. No cathartics were given. Those patients having local anesthetics are instructed to have their usual morning meal, while those taking a general anesthetic are not allowed anything by mouth on the day of operation.

2. Hospitalization.—All of our cases are hospitalized.

3. Anesthesia.—We have been using nitrous oxid and oxygen induction followed by ether. For local tonsillectomy, we are now using 1 oz. of a $\frac{1}{2}$ per cent procain solution with 6 min. of a 1 to 1,000 adrenalin chlorid solution, with which we have been able to secure complete anesthesia.

4. Technic.—In local tonsillectomies the patients were given a hypodermic injection of $\frac{1}{4}$ gr. of morphin sulphate, while those taking a general anesthetic were given the same, together with 1/150 gr. of atropin sulphate. Small children are given scopolamin, 1/200 gr., by mouth, one-half to one hour before operation. In the cases with local anesthesia, 4 drops of a 20 per cent solution of cocain hydrochlorid with 1 min. of adrenalin chlorid, 1 to 1,000 solution, were rubbed in between the tonsil and the anterior and posterior pillars. Two such applications are made with a cotton tipped applicator. One swabbing was made to the posterior pharyngeal wall and one to the uvula, to prevent gagging.

All cases were injected with the patient in the recumbent position. Three injections were made in the anterior pillar and one in the posterior pillar. The injections were not made directly through the anterior pillar, but in the space between the tonsil and the pillar.

5. Asepsis.—It was impossible to have a tonsil operation entirely aseptic, but we endeavored to make it as sterile as possible.

All tonsillectomies, including those done under local anesthesia, were performed with the patient in the recumbent position. A Klaar reflector was used, because the light was not diffused but could be focused on the area which was being operated upon.

We have tried various makes of hemostatic tonsillotomes, but prefer the Walker instrument, with a slight modification

by the author. Not all of our cases are bloodless, but at least 75 per cent are, adults included, of course. No sponging of the fossæ was done unless there was bleeding. We have given up suction, as we thought it favored hemorrhage.

As a rule, no opiates are administered after operation, but three tablets of sedabrol in a cup of hot water was given to the patient if he was restless or in pain. This equals 45 grs. of sodium bromid.

In some cases considerable comfort was secured by application of 50 per cent silver nitrate solution to the hyperemic areas. Good cosmetic results were also obtained by its use while the white membrane was still present, followed by the application of a saturated solution of scarlet red in tincture of benzoin compound after the membrane had disappeared. This stimulated epithelization in the tonsillar fossæ. Within the past month we have been using a white powder, which Dr. W. Mithoefer advised for pain, with good results. This powder consists of: Anesthesin, aristol, aa oz. one-half, menthol, grs. 10, insufflated into the tonsillar fossæ every three hours. After operation an ice bag was applied to the throat.

DISCUSSION.

DR. G. L. RICHARDS suggested for the first three hours the pulse be taken thrice in the hour and recorded on a chart, so we might know of any sudden rise, as from hemorrhage. In the after care 15 grs. aspirin is used, put in two-thirds of a glass of water, and the patient told to rinse the mouth with that and occasionally to swallow. The local action of aspirin was very efficient, and the little swallowed adds considerably to the patient's comfort.

DR. INGERSOLL said that one point in this paper which he wished to emphasize was proper surgical antisepsis. The laryngologist was often justly criticised by the general surgeon for faulty technic in his operative work. The nose and throat are constantly exposed to various infections in the air, and they have established a certain immunity, but this was no excuse for poor technic. It was very essential that our technic should be of such an order that it prevents the introduction of any new infection in the field operated upon.

Another point which he wished to emphasize was careful and skillful work. All of us have seen tonsil operations done

more by brute force than by skillful methods, and the reaction from such forceful manipulation must be greater, thereby causing more discomfort to the patient. It should be remembered that we are dealing with delicate structures and treat them with due respect.

DR. J. H. BARNHILL said with general anesthetics, it seems to him, satisfactory anesthesia depends more upon the anesthetist than upon the kind of anesthetic. The Doctor speaks of using 6 minims of adrenalin chlorid. If he was not mistaken, Dr. Harris a few years ago reported several deaths from the injection of a small amount of adrenalin chlorid, 6 minims he believed, and when he compared this with the very much larger quantity he saw used by general surgeons, he wondered. In operating about the neck, in operations on goiter, as much as 30 m. are often given. Was there an especially grave risk from the injection of adrenalin chlorid in and around the tonsils that does not exist anywhere else? In the after treatment he had for the last several years used aspirin powder, together with acetanilid, 2 grs. of aspirin, 1 of acetanilid. This powder gives almost absolute relief from any after pain.

DR. T. J. HARRIS replied that in this exceedingly practical paper of Dr. Large's he would be sorry to have the impression go out from this Association that adrenalin was a safe drug.

DR. H. J. LILLIE said his observations had led him to believe that there are as many good tonsil technics as tonsil operators, and that the bleeding in any tonsil operation was largely dependent upon the size and number of blood vessels in the tonsillar fossa in the individual case.

Diagnostic Limitations in Laryngology.

By W. V. MULLIN, M. D.,

COLORADO SPRINGS, COLO.

The impression has been growing upon the writer that we take our failures and our responsibilities in laryngeal diagnosis too lightly. This seems to be particularly true with regard to syphilis, tuberculosis and carcinoma.

An effort to make a diagnosis by inspection alone was an error made by all of us too frequently. Diagnosis cannot be determined without a thorough knowledge of the clinical and

pathologic phases of disease, and if this knowledge was not possessed by the laryngologist it must be supplied.

A negative Wassermann does not exclude syphilis, nor the presence of a pulmonary lesion prove a tuberculous laryngitis; a positive Wassermann does not exclude malignancy. The law of probability may serve to point the way to a diagnosis, but it was a weak stick to put much weight upon.

Because of etiquette, the patient may be denied a proper general examination. Errors in technic must be allowed for. Too much reliance on a single negative examination may mislead. Two instances where the Wassermann was of vital importance and the report misleading are given in detail.

A few of the conflicting views of those who should speak with authority on biopsy in suspected carcinoma are quoted. Opinions seem to be about equally divided as to whether we should regard biopsy as a legitimate aid to diagnosis or a criminal offense. Two of Sluder's cases are mentioned in which the pathologic report was ultimately found to be incorrect.

The diagnostic sixth sense is recognized, which Delavan speaks of as a "subconscious reasoning based upon long experience of many closely observed cases." The great majority of patients, however, pass through hands which do not possess this gift.

In conclusion. The limitations and responsibilities of diagnosis in this field are not sufficiently recognized by the average laryngologist. This specialty suffers by too great an isolation from the parent stem.

DISCUSSION.

DR. G. L. RICHARDS said he thought the early diagnosis of intralaryngeal cancer was one of the most trying things the laryngologist has before him. He had come to the conclusion that next time he had definite diagnosis in one of these cases he would use the galvanocautery direct and let the patient have his larynx. It won't cure him, but will often prolong his life. He was sure he had been very wrong in doing the biopsy.

DR. D. C. GREENE said in reference to Dr. Richards' remarks it should be stated that in dealing with any series of

cases of malignant disease we are bound to encounter failures from operation except in favorable cases. In the larynx a favorable case was one in which the growth was definitely limited within the laryngeal box and can be entirely removed with a wide margin of healthy tissue around it. In cases of doubtful diagnosis a biopsy, followed by immediate operation, if a positive diagnosis was made, was, he thought, the proper procedure. He had done this in many cases, which have remained apparently cured for many years after operation.

The diagnosis of laryngeal tumors was, in his experience, at times a very difficult problem. Only last week he had operated upon a patient with what was apparently a benign polyp arising from the anterior commissure, and which on microscopic examination proved to be squamous cell cancer. He thought it should be emphasized that the longer the interval between biopsy and operation the greater the danger to the patient.

DR. T. E. HUBBARD said as to the laboratory decision of malignancy, he thought the conclusion of surgeons was that in borderline cases, and these are the ones concerned with, only thorough sectional examination can determine. Sectional examination embraces tissue from base to outlying parts of the tumor. So that we should not blame the laboratory report unless we are sure that we have given to the laboratory an absolutely fair specimen for sectional examination. The point was with reference to the question of biopsy. It is not wise to meddle with a tumor mass in the larynx if it can be decided in any other way. The fulguration test is harmless and fairly decisive.

DR. J. H. BARNHILL thought we ought to go on record with regard to the biopsy question. He believed the greater weight of opinion was against it. It is against it in general surgery. There is more reason to oppose it in laryngology.

DR. DEAN thought the question of biopsy was as important a problem as can be considered. It may be some little value to give you our conclusions. He felt in his work that biopsy should not be performed unless there was a definite indication. In the larynx he never performs biopsy unless consent from the patient was obtained that, should the biopsy show malignancy, radical operation would be performed.

DR. SHURLY said it seemed to him that the diagnosis problem of laryngeal tuberculosis depended upon the fact that there were no cases of laryngeal tuberculosis, with rarest exception, unless we have pulmonary phthisis. If the X-ray was important to status lymphaticus it was a thousand times more important in tuberculosis.

DR. GORDON B. NEW said he did not believe we should go on record that biopsy should not be done in laryngeal tumors. One sees a number of indeterminate laryngeal tumors, where the only way a diagnosis can be made was by a biopsy. Of course, this does not include the group of unilateral laryngeal tumors, without ulceration, in which a thyrotomy was necessary for the removal in any case. In this latter group there was no necessity to take tissue for diagnosis before the operation, as the frozen section can be made at that time. In this latter group might be the epitheliomas of the larynx, originating in the ventricle, and tuberculomas. He had an experience about a week ago, somewhat like Dr. Greene's, in which a pedunculated tumor was removed by the intralaryngeal method; this was thought clinically to be a myxoma, but showed microscopically to be a squamous cell epithelioma, grade four. He thought we should follow the grouping of our tumors, as brought out by Dr. Broders, as to their type of malignancy. In this way we can better determine the prognosis.

DR. G. L. RICHARDS recited a case having a small growth on the larynx, and that appeared to be malignant, and which on biopsy caused a difference of opinion. However, laryngectomy was not done and the patient was still alive, after ten or twelve years.

DR. H. L. SWAIN remarked that he had an exactly similar instance to Dr. Richards, where two pathologists and laryngologists, excluding himself, were in doubt as to the diagnosis. He did a thyrotomy. As Dr. New said, we thought we ought to, anyway, but it was so much a matter of doubt that we waited for some time before doing it. What we removed proved to be epithelioma, as judged by microscopic study later. The man is living now, using his voice as a public speaker, and it is over twenty years since the operation.

SOCIETY PROCEEDINGS.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of Monday Evening, February 2, 1925.

THE PRESIDENT, DR. E. P. NORCROSS, PRESIDING.

Speech Complications.

DR. AUSTIN A. HAYDEN presented a patient who had worn a velum obturator for a number of years. When she was two or three years old her mother took her in to see Dr. Gunn, who advised that nothing be done until she was older. She waited until she was about nineteen, when the family moved to Chicago. She then secured a soft rubber obturator or velum and wore this for about fifteen years, having it changed every year or two. There were certain objections to this. After she wore it for a while the food tasted of rubber, and she thought she could detect the odor of old rubber. Food would lodge beneath it and she would have to take it out and clean it. About five years ago Dr. Case made her the hard rubber obturator which she still wore. It has been so comfortable that she is not conscious of wearing it. She had a mould by which another obturator could be made whenever necessary.

DR. OTTO J. STEIN presented an infant with a marked palatal defect.

Introductory Remarks.

DR. FRANK G. BRUNER, Director of Special Schools, Board of Education (by invitation), said he supposed he was asked to make some introductory remarks because of the intimate relation that obtains between speech defects on the one hand and the child's work in the public schools, as well as his success subsequently in life, on the other. Speech defects, more than any other handicap, except, perhaps, blindness and deafness, interfere with the child's progress in his school work and his success in life. He is handicapped in his school work for the

same reason that he is handicapped in business and socially, primarily because of a feeling of inferiority. It has been their experience that many of the children with speech defects in the public schools admit failure and say they cannot participate in a recitation rather than acknowledge their inability to speak. There is, no doubt, among these individuals many who feel that a physical inferiority, as well as a mental and moral inferiority, is sinful, and they do not like to admit their condition.

Dr Bruner referred to a boy with a high pitched voice, a student in the Senn High School, who refused to recite because he did not wish others to hear his voice. After some instruction in the correction of his speech, this boy became one of the honor students in his class and a member of the debating team. He has known many adults with speech defects who had developed an inferiority complex and were failures who, after the correction of the speech defect, became aggressive and successful in their work. It is difficult for people with speech defects to find employment, and there are some lines of work in which they cannot engage. Hence the extreme importance of speech correction work, and, obviously, the earlier begun the better.

In the Chicago public schools at present there are thirteen teachers engaged in the correction of speech defects, who go about from school to school giving their treatments. They use the psychologic mode of approach. They are not laryngologists or psychologists but teachers, and therefore in some cases require the assistance of laryngologists and psychiatrists for expert advice. They employ very largely the individual method. In some special cases the class or group method is used, but the individual method has been found much more successful in their hands. The method consists of relaxation, breathing, tongue and vocal exercises of one kind and another, the aim being to develop poise and unselfconsciousness. They use somewhat the same exercises for stuttering as for defects due to other causes, with such modifications as each individual case may require.

Last year the teachers worked in 207 schools and treated 2,300 children. They were able to see each child only ten or fifteen minutes at a time. Some were seen twice a week but most of them only once. Children are given exercises to prac-

tice by these special teachers and the results are checked up at the end of a week.

They classify speech defects as major or minor. Minor defects are those which are purely matters of habit. Major defects are constitutional. Many children have defects of articulation who can speak correctly if their attention is called to it. These are classed as children with minor defects, and those who cannot speak correctly until treated constitute the major group. Of the 2,300 children treated, some for one year and some for two years, the teachers were able to dismiss as cured 1,200 and to show marked improvement in the speech of 800 more. They brought about either cure or improvement in 70 per cent of all major cases treated, and in 88 per cent of all minor cases. They are able to bring about a cure in the cases of those whose speech defect is due to persistence of childhood habits of speech, and those whose defect is due to minor mental disorganization. Dr. Bruner considered the work well worth while if it is possible to cure or improve 70 per cent of speech impediments.

Their relations with laryngologists are not as close as they should be because, as a rule, laryngologists are not particularly interested in speech defects, and also perhaps because of the failure of the schools to call upon them for help as frequently as they should. This is difficult to do unless laryngologists can offer some such organization as the League for the Hard of Hearing or the Illinois Society for the Prevention of Blindness, where there is an official personnel to which to refer them. He expressed a desire for closer cooperation and a belief that it would be mutually beneficial.

Dr. Bruner closed with words of appreciation of the splendid scientific work in speech correction which Dr. Kenyon is doing, and the valuable assistance he has given in the speech work in the schools.

Speech Complications of Inadequate Palates, With Exhibition of Patients.

By E. L. KENYON, M. D.

DR. ELMER L. KENYON said that an adequate palate, from the speech standpoint, is one that is capable of completely closing the pharyngeal-nasopharyngeal isthmus for speech pur-

poses. This closure may be accomplished (1) entirely by the palatal structure and the palatal musculature; or (2) by the palatal structures (usually physiologically impaired), plus the assistance of the superior constrictor muscles. An inadequate palate is one that is incapable of completely shutting off the nasopharyngeal isthmus for speech purposes.

Little has been written and little is known concerning the origin of the congenital short palate. By the ordinary examination, this sort of palate usually appears normal. Only on close analytic study is it realized to be inadequate to completely close the palatal isthmus. An adequate soft palate must measure considerably longer between the posterior border of the hard palate and the lower edge of the soft palate than between the posterior border of the hard palate and the pharyngeal wall. It has been maintained that, if the soft palate be inadequate, its lack is due to deficiency not in the velum, but in the hard palate. Substantiating this assumption, one finds in certain cases of congenital short palate a central indentation, or defect, pointing forward, in the posterior border of the hard palate. This is apparently a miniature of the larger defects of like character found in cleft palates. Such a defect was present in Case No. 1. On the other hand, this defect sign in the hard palate is not always clearly present in congenital short palate cases, as was shown in Case No. 2. For the present he was inclined to consider the shortness of congenital short palate as due in certain cases merely to Nature's skimping in supplying sufficient length of tissue for this structure.

Palatal Condition in Case No. 1.—N. E. T., male, white, age 17; third year in high school; excellent mind and character. As a whole, the palate appears normal. Distance from lower border of soft palate to posterior pharyngeal wall seems unusually large to the eye. Distance of posterior border of hard palate to pharyngeal wall is greater than the distance to the posterior border of the soft palate by one-quarter inch. Small indentation pointing anteriorly in posterior border of hard palate.

Condition of Palate in Case No. 2.—E. N., female, white, age 15; sixth grade in school; has not been regular in school attendance; fair mentality; excellent character. In general appearance of palate, normal. Border of soft palate far removed

from posterior wall. Posterior edge of hard palate rough, but not clearly indented. Normal effort to move on phonation. Scarcely possible to force soft palate to posterior wall by careful instrumental pressure upwards and backwards.

Condition of Palate in Case No. 3.—L. K., male, white, age 13; good mind and character. Palate and speech were normal up to age 3, when nasality of the voice followed a severe infective sickness. Palate well formed and anatomically on testing seems nearly or quite sufficient, although some stretching possibly was employed. On phonation, the movement of the right side of the palate lags behind the left, and the palate does not completely reach the posterior wall.

From the speech standpoint, the congenitally short and similarly impaired palates are more dangerous than cleft palates. This is because the cleft palate is understood and is known to require special operative as well as speech attention, while the other types, not being understood, are allowed to drift indefinitely. Such had been the fact in all of the above cases. Each of the patients suffered from three distinct types of speech disorder:

1. Open nasality.
2. Disordered articulation.
3. Abnormally high pitch and monotony of voice.

Case No. 1 in addition stammered at times. Case No. 3 had largely recovered from articulatory defects, which, however, in cases 1 and 2 were so severe as to render the speech in large part not understandable.

The disturbance in the psychology on which disordered articulation depends in patients with inadequate palates was explained. Also the manner of training of the voice and speech in such patients.

While many cleft palate patients, through operative correction, assisted by speech training, obtain a very excellent speech, the situation in general, from the speech standpoint, of all patients with inadequate palates is far from satisfactory. If speech training were entered on early in the speech development period, and were persisted in, much improvement would be made. Also if it were possible, through training, to call at will upon the superior constrictor muscles to aid the impaired palate to accomplish complete functioning for speech purposes,

the situation would be vastly improved. Individual patients do accomplish this. The speaker had for some time been endeavoring to find a method for accomplishing this important advance step in training methods.

Case No. 4 was an operated girl of 5 years, whose palatal inadequacy was due to complete palatal cleft with double hare-lip. She had been operated on several times by Dr. Frederick B. Moorehead, with excellent functional result.

Case No. 5 was a girl of 7, in whom extreme nasality had immediately followed tonsillectomy at 5 years. The speaker strongly suspected the original existence of congenitally short palate in this patient. The tendency of physicians, as indicated by the history of these cases, to perform the tonsil-adenoid operation indiscriminately in order to improve disorders of speech, he considered an indication of a lack of operative intelligence with respect to speech conditions.

DR. W. H. G. LOGAN (by invitation) confined his discussion to the indications for the surgical and mechanical correction of congenital cleft palate. He agreed with Dr. Kenyon that there were many important phases of the subject that should make particular appeal to all physicians called upon to deal with diseases and abnormalities of the nose, lips, palate and throat. His discussion was illustrated with slides, the first of which demonstrated the importance of not cutting all or any part of the fibers of the muscles of the palate to any degree that would interfere in the future normal function of these tissues.

Although Dr. Logan presented a single technic for the surgical correction of congenital cleft of palate and lip, he did not contend that other methods would not produce satisfactory results, providing (1) that the method followed avoided making such incisions as would destroy or reduce the function of the important muscles of the palate as they are called upon in the various movements of speech; (2) that the operative procedure followed avoided, in so far as it is possible to do so, any unnecessary shortening of the palate; (3) that the method adopted definitely reduced the distance between the borders of the bone cleft directly in from the tuberosities in those cases where the cleft is extremely wide; (4) when the cleft palate extends completely through the hard palate and the maxillary

ridge, the surgical correction reestablishes the maxillary ridge and the floor of the nasal fossa, at least in its anterior part, and (5) if the cleft in the lip is complete, the correction should be of such a nature as to permit the repaired lip to function relatively normal and in appearance and thickness to be symmetric with the tissues beneath the nostril on the normal side.

One slide was used to illustrate the point that many children having normal palates but defective lips speak imperfectly, as some of these individuals cannot say "boy," "Peter," "bat," "papa," "mamma," "lip," "back," unless they have lips that meet normally. Unless the maxillary ridge is properly formed so that the teeth may erupt relatively normal, or may thereafter be normally supplied, these patients will be unable to properly articulate such words as "vain," "vanity," "front," "fast," "farthest."

In closing his discussion, Dr. Logan summarized the sequence with which these operations should be performed upon infants, as follows:

An infant born with congenital cleft of lip but having a normal maxillary process which may or may not be complicated with cleft to any degree of the soft and hard palate, posterior to the normal anterior maxillary process, should not have the lip deformity corrected until it has ceased to nurse, unless the surgeon is positive that the mother's milk may be maintained throughout the entire postoperative treatment.

In cases where there is a normal maxillary process, as described, and the infant is not receiving its nourishment by nursing, the operation upon the lip need only be postponed until a proven formula has been found, its birth weight regained and satisfactory physical condition is established.

Patients presenting with complete congenital cleft of the hard palate, maxillary process and lip should have the defect in the maxillary process closed first. (The only exception made to this statement is in those cases where there is such a marked deficiency in the bony parts that to bring them into contact would occlude the nasal fossa on that side and produce a deformed upper arch.)

To avoid undue surgical shock, it is held to be advisable in the majority of these complicated cases not to operate on the complete cleft of the lip until four to eight weeks after the

operation for closure of the cleft through the maxillary process and a narrowing of the width of the cleft straight in from the tuberosities takes place.

If the case is complicated with protruding premaxillary bones they should never be excised, but always retained and placed in position to be made an integral part of the jaw, as they contain, as a rule, the germs of the upper deciduous and permanent incisors and form a necessary support to the upper lip.

When separated bones are brought into position, the compact surface is removed so that a bony union may be secured in the line of the maxillary ridge.

A good percentage of cleft palate cases should have mechanical rather than surgical procedure to close the cleft.

Most cleft palate children should receive voice training after the surgical correction of the defect, even though the congenital defect in its entirety has been completely united.

DR. MEYER SOLOMON (by invitation) stated that so far as the strictly organic neurologic aspect of this subject was concerned, there was nothing to say, but the functional results, such as nasality, high pitch and disturbances in articulation, were important from the broader neuropsychiatric viewpoint, meaning by this the personality reactions of the individual to the situation, which in this case was the palatal defect with its accompanying speech defect.

The palatal defect and the speech disorder directly resulting therefrom may produce certain mental reactions which in their turn are responsible for certain disorders in speech, a circular process resulting. The speech disorders associated with palatal defects may be due to the latter, either directly, by the mechanical malformation, or indirectly, by nervous and mental habits and attitudes.

In meeting any obstacle or handicap in life, and this applies to palatal defects and their associated speech disorders, we instinctively adopt one of two main methods: flight or fight. In adjustment by flight there are varying degrees of self-abasement, such as shame and embarrassment, self-consciousness, fears, overtimidity, feelings of inferiority, incapacity, insecurity, helplessness, ideas of self-depreciation and self-accusation, shyness, etc. Occasionally the *eingeschlossen*

or shut-in tendency occurs, with self-isolation, over-repression, inaccessibility and uncommunicativeness. These varying degrees of repression of the personality arise from mental conflicts centered, in these patients, about the palatal defect with its concomitant speech disorders. This is shown not only in speech but in behavior, expression, decision and thinking, so that the groundwork is laid for later neurasthenic, hysterical and psychasthenic reactions, even for paranoidiform reactions with oversuspiciousness and ideas of reference.

Adjustment by fight may be blind or directed. When blind, it is uncritical and extreme, with overassertion and overcorrection, so that the child may be overproud, overbold, jealous, etc., or truancy and delinquency may occur; or there is excessive interest in speech, or unduly slow speech, or talking too much, and similar reactions. When adjustment by fight is directed, there is resort to compromise, with the adoption of a common sense method in which the child accepts the situation calmly and quietly, and with determination and a directed technic, endeavors gradually to improve his speech, without overassertion or self-abasement. For this the patient needs careful guidance.

When other defects, oral or elsewhere, are present, especially nervous, mental defects, or definite feeble-mindedness, the situation is more difficult and serious.

The possible speech reactions in these cases may conveniently be classified as follows: 1, Imperfect speech caused directly by malformations of the speech organs, in this instance the palatal defect. 2, Voice defects after operations done in these patients, whether adenectomy or otherwise. In both conditions just mentioned, especially in mild and borderline types, it is often difficult to determine just how much is really due to the mechanical defect and how much to the habits and attitudes. In both cases one must restrain speech and correct false mental attitudes. 3, Sluggish enunciation due to poor muscular coordination, some of which may be physiologic but much of which is psychologic. 4, Retarded speech due to lack of incentive, attention or effort, dependent upon feelings of inferiority. 5, Infantile substitutions not caused by the palatal defect but by errors carried over from early childhood to later years. 6, Voice defects not organic but merely reflecting the

mental states, such as high pitched voice from nervous tenseness and excitement, low and weak voice from timidity, etc. 7, The definitely nervous speech disorders labeled nervous hesitation, cluttering (a rapid, choppy utterance with slurring over or omission of parts of words), stuttering and stammering.

An analysis of the above mentioned speech disorders shows that it is in the first two that mechanical defects must be given special consideration. Patients with the first two conditions may have one or more of the other speech defects, these being but superimpositions which can be prevented and cured only from the neuropsychiatric approach, with speech training. Even in the first two conditions, it is often difficult to determine, especially in mild and borderline cases, just how much is due directly and positively to the mechanical defect.

Many of these patients need careful personality study or mental analysis, of the common sense and not fantastic sort, to give them nervous and mental balance and a proper philosophic attitude toward the situation. This is especially important in early childhood and at puberty. Encouragement, morale, the carrying-on spirit, psychic hardening and immunity to criticism, ridicule and repeated failure are needed. The cooperation of the parents is essential.

Dr. Solomon believed that if anything definite or positive can be done by mechanical methods or surgery to correct the mechanical defect, it should be done. In the average case, other than cleft palate, no such aid can be given. Speech training and exercises are indicated to improve the technic of speech. Often what is more necessary than mere technic of speech is calmness, poise, living in what one says and taking time to say it, with clear enunciation. The nervous and mental aspects and complications in each case must be looked for, recognized and eliminated. In fact, they should be handled first and the treatment continued with speech training. Careful personality analysis and study are frequently essential. He congratulated Dr. Kenyon for his interest in this work, for keeping the subject alive and for his sincerity.

DR. LOREN D. SAYRE (by invitation) said that his side of the subject was the prosthetic correction of palates, whether congenitally abnormal or otherwise. He paid tribute to the

work of the oral surgeons and believed that the proper correction of cleft palates is usually surgical, that it is much more comfortable and much more sightly to the ordinary observer.

He was delighted to meet a man like Dr. Kenyon, who has the patience and the desire to help these people, and believed there was need for many more men of this type for the benefit of people in whom neither surgery nor prosthetic appliances are indicated. In the patients presented by Dr. Kenyon there was nothing that Dr. Sayre could have accomplished from a prosthetic standpoint. The cases due to accident or to congenital shortening of the entire cleft because of failure of union of the hard and soft palates present a very difficult proposition. Many of the cases that come to his attention have been operated on anywhere from one to twelve or fourteen times, many of them by men who never should operate in this class of cases. He finds in the palate closure of the place that the dentist needs for retention of the appliance he wishes to make, and in the hard palate there is cicatricial tissue which renders it almost impossible to make an appliance which can be retained. They can accomplish much more with a wide open cleft than with one which has been improperly operated. Three men in dentistry have done outstanding work in these cases. The first was Kingsley, the next Dr. Case of Chicago, and another man who is now doing a great deal of this work is Tapany in Zurich. These patients are widely separated. They come to the man who is doing this work, but he soon loses touch with his patients. There is not often enough cases in one city to enable a man to devote his entire time to this specialty, and it requires a great deal of time to carry the work out. The patients develop to a point where they think it is unnecessary to keep in touch with the doctor, or they drop back into the old habits they had before their correction.

In many of the cases Dr. Sayre has constructed there has been improvement, but some are not brilliant successes. In two or three instances the patient can speak distinctly and in others not so well. He is convinced that the difference has not been due to the appliance that has been used, for some of the appliances which he counts as absolute failures, so far as results are concerned, have been as near a perfect fit as it was possible to make. The difference in results is due to the

temperament of the patient. Either they have not the desire, the ambition or the pride to go to all the work that is necessary for them to improve or to correct their speech, or there is an inability on their part to do this. The operator cannot take all the responsibility, if they make it possible, in so far as they can, for the muscles to develop. The patients with congenital clefts must learn to speak as though they had not been unable to speak the words correctly in infancy. They have learned up to the time their cleft is corrected to speak words incorrectly, and their mentality has developed so that they speak the words incorrectly. After correction they must start with the words which are commonly mispronounced and gradually lead up to the point where they will make an effort to correct all their defects.

The first appliance is usually made of velum rubber. The tissues take more kindly to this soft material than to any other, and after it has been in place for two or more years a hard rubber or a metal appliance can be inserted. The metal appliance is probably the best thing that can be used, so far as resonance of the voice is concerned. Dr. Case made his appliances in one piece, merely to rest on the nasal floor on one side and the palatal ridge on the other, extending back toward the posterior wall, but not entirely to the wall, for one must allow for movement of the muscles in deglutition. The tissues around these appliances develop, depending upon how much the patient uses the muscle, and each successive appliance can be made smaller. Patients frequently improve a great deal after the appliance is removed. The obturators and the velums which are made in one piece are the most successful, but few men have been able to construct them. Dr. Case was a genius in this line and probably did better work than anyone else. The majority of these appliances are made in conjunction with teeth, and in this way missing teeth can be reconstructed. They make the appliances with a pin in the soft material and in the hard rubber obturators with a hinge which will allow the muscles to improve at the proper time. They get the best results in this work with patients between fifteen and twenty-five years. After that patients seldom care to go to the trouble of correcting their speech, for they have acquired habits and methods of living and making themselves under-

stood and are satisfied to go on as they are. The mentality of the patient must be considered, and success occurs in direct comparison with the mentality of the patient. Many of these children will not go to school because of the cruelty of the other pupils in mimicking them and making fun of them, and that must be overcome. They must be put in a position where they have to make an effort to meet the situation, all of which is difficult.

Dr. Sayre expressed his pleasure in learning of someone to whom he could send such patients after they had been corrected so that they could be taught to speak properly.

DR. D. P. MACMILLAN, Superintendent of Public Schools (by invitation), emphasized the desirability of making a thorough mental and physical examination of every patient. In so many instances it is found that in the nonorganic defects the speech defect is symptomatic of a general disorder, a constitutional neurotic defect evidencing itself in the speech disorder. It may likewise be indicative of a receptive defect, which touches the otologists. The direction of education should be in the correction, first, of all defects, and, second, to raise the ability to detect small differences received. There is one school of voice training which bases its entire procedure upon that one step. In the total arc of receiving and giving out, the attention is directed not so much to the expression as it is directed constantly to securing accuracy in differences received. As an illustration, the best artists in vocal expression are always obtained by this direction, and until this is done it is almost impossible to make superartists.

The key to success in this work, therefore, is that attention should be directed to the receiving and only incidentally to the expression, reversing the whole process as it is emphasized now, not only to secure composure, but reeducation to secure impressions and also the reflex of expression.

DR. ROBERT SONNENSCHNIE thought everyone was agreed upon the great patience and perseverance of Dr. Kenyon in this line of work and was proud to have him in the community. Of the many valuable points which had been brought out, nothing was more valuable than that of prolonging the palate.

The speaker asked what Dr. Kenyon thought of the procedure which he saw in Berlin in 1909, by Ekstein, who injected hard paraffin under the posterior wall of the pharynx at the places where one would expect the apposition of the palate and the wall. The hard paraffin does not cause embolism and is practically permanent, and this physician claimed to get excellent results in producing this apposition.

Dr. Sonnenschein also asked Dr. Kenyon's opinion about the removal of adenoids, and stated that in many instances the speech had been made worse by adenoidectomy where a rhinolalia aperta was present.

Dr. JOSEPH C. BECK thought some of those present would remember that fifteen years ago he presented a patient with a congenitally short palate, in whom he injected paraffin retropharyngeally. The girl was kept at the dispensary for the benefit of students who wished to examine the postnasal spaces. She could not close her posterior space, so she was a good subject. He had the woman make a record of her speech on a phonograph disc, and he wished to bring out this point because Dr. Kenyon did not mention it. This patient always said she thought she spoke like everyone else, and when she heard the reproduction of her speech on the phonograph record she collapsed. Dr. Beck injected the hard paraffin in a line where it would meet the soft palate in speech, and it made a marked improvement. In order that he could watch the patient he placed her in the employ of their hospital and kept her there for five years. Within six months the paraffin sagged and an additional injection had to be made on top of it, and then he he had to remove the whole thing because the patient had gagging sensations.

He asked whether Dr. Kenyon would consider an external operation through the neck, exposing the anterior common ligament and implanting a piece of ivory which would produce a projection there, as a worth while procedure.

He also asked whether Dr. Kenyon used the nasopharyngoscope to demonstrate the things that are going on there during phonation.

Dr. AUSTIN A. HAYDEN said that in the preparation of the program two very interesting facts were discovered. In the first place, Dr. Kenyon is the only medical man in this part of

the country who has done any considerable amount of work in the correction of speech defects. At first it was thought that Dr. Kenyon could make a ten or fifteen minute presentation that would cover the ground quite adequately and that there would be room for another paper or two on the evening's program. It very soon became apparent, however, that the Society could profitably devote the entire meeting to the consideration of this subject. Accordingly the oral surgeon, neurologist and the prosthetist were called upon to present their respective sides of the subject.

Very fortunately, Dr. Solomon's interest in the program was secured. His neurologic discussion was doubly interesting because he spoke with ease and fluency, although a few years ago he suffered from a very pronounced speech defect. He combined a striking exemplification of the efficacy of Dr. Kenyon's teaching with a really worth while neurologic elaboration of the speech defect problem from an intimately personal point of view.

Not only do very few medical men specialize in speech defects but very few dentists pay much attention to prosthetic appliances for cleft palate cases. He fancied that Dr. Logan and Dr. Brophy were to blame for the difficulties of the prosthetists, for after they get through with these patients they are either all dead or do not need an obturator or other appliance, but the patient he presented was an example of the need of such an appliance. Dr. Case for many years was the outstanding figure in this work and, strangely enough, left no one to succeed him directly. Dr. Hayden had known Dr. Sayre for a number of years, but did not know that he paid particular attention to this line of work. Only after a considerable investigation did it become apparent that he was the best equipped dentist in Chicago to present this very important phase of the subject.

Dr. Hayden thought Dr. Kenyon had criticized tonsillectomy rather severely and stated that the patient he presented had her tonsils removed, on the advice of her family physician, because of recurrent sore throat. This was done very carefully, without any mutilation of the pillars. The patient said her speech had been greatly improved since the operation. Many of her friends had also noticed the improvement. A number

of Dr. Brophy's and Dr. Logan's cases that Dr. Hayden has seen have been similarly benefited.

DR. ALFRED LEWY believed the question of using any kind of filling material raised the question of interference with the soft palate and the isthmus of the pharynx in general. He believed the function of the isthmus is not only performed by the approach of the soft palate to the posterior wall, but also by the approach of the lateral wall, including the cushions of the eustachian tubes, in a sort of sphincter action. The approach is from all sides at once, and this must be taken into consideration in making any appliances, or in the addition of any foreign material to narrow the opening. Otherwise, the very thing they wished to bring about, the education of the patient in closing the opening by his own musculature, may be defeated.

DR. J. HOLINGER asked Dr. Kenyon to explain why there was no regurgitation of fluid through the nose when these patients swallowed. If the palate was really so inadequate, he could not understand why this did not occur. The mother of Dr. Stein's patient admitted regurgitation at once in her child, but none of the patients whom Dr. Kenyon showed even knew anything of the possibilities of regurgitation.

DR. OTTO J. STEIN stated that in his patient there was not only the palatal shortening, but the tongue was cloven to the roof of the mouth so that there was almost complete immobility of the tongue. He believed the inadequacy of the soft palate was due to lack of development, or foreshortening, of the hard palate. He had noticed in a few adults who had had their tonsils removed and who had not only an absence of the uvula that there was such a shortening of the palate. It stretched right across the space and there was no defect in the center view. He asked if this was due to the fact that the constrictors supply the necessary muscular action to close off the space in the nasopharynx.

DR. KENYON (in closing) said that some years ago, in looking up the literature with respect to the congenitally short palate, he found very little. He did not make any attempt to investigate the German or French literature, but there was almost none in the English. An English writer years ago said the congenitally short palate was nothing but a manifestation

of a congenital defect, and that the edge of the hard palate was indented in these cases. In one of the patients Dr. Kenyon presented this was not true. He has found the same indentations in palates that were perfectly adequate, and believes some of the palates are developed inadequately, not necessarily in association with cleft.

He did not wish to be understood to be criticizing the operation of tonsillectomy. The last word about that operation had not been said, and it must be determined where tonsillectomy is indicated and in which cases it is wrong to use it.

As to the paraffin injections, where there is so much muscular activity, he believed that as a matter of course it should not be used. Neither did he believe that any substance placed against the anterior wall of the spinal column could be of benefit. He did not see how such a procedure could be employed without interfering with the anterior constrictor and the other muscles along the spine, where an intricate mass of muscles is attached to the bone.

As to the adenoids, he believed that in many of the cleft palate and short palate cases these should not be removed as a routine procedure, because the adenoids help the patient to produce a normal, adequate voice, and if they are removed this adds to the nasality. In later life it may be safe to remove them after the patient has become more educated regarding the use of the palate.

Dr. Kenyon believed that it is not right for laryngologists to perform operations indiscriminately, in order to improve the voice. The cases should be analyzed in a finer way to determine whether the tonsils and adenoids should be removed.

As to the regurgitation of fluid, he emphasized his former statement that there are two kinds of inadequate palates, and that the type he presented, for the most part, does not have regurgitation of fluid. He is interested in having these children develop a mouth voice, and if he could bring about the same mechanism for talking as that employed for swallowing there would be a vast improvement in the speech.

He believed if the patient which Dr. Stein presented proved to be intelligent, the speech would be worked out quite well, but if the child proved to be stupid there would be very serious speech impairment, unless surgical measures could improve the

condition. He thought the child should be put on training as soon as it began to talk.

In regard to the singing voice, mentioned by Dr. Stein, singers tend to employ some degree of nasal resonance, because thereby they get a more beautiful singing voice. They use the palate without completely raising it, and if this relatively incomplete action of the palate were not disturbed by operation the singing voice would be likely not to be impaired.

